the OIL AND GAS JOURNAL
SEPTEMBER 22, 1958

EXPLORATION SECTION p. 129

Higher Gasoline Taxes Next Year?

Federal plans to take a bigger bite should cause concern among marketers p. 51

Boom Predicted for LACT

"Within 10 years we will probably be running 80% of all our crude through LACT systems." p. 54

A new method for

Regeneration of Alkaline Solutions

. . . used in extracting mercaptans from petroleum distillates p. 89

Quick Payout for California Water Flood p. 77

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OIL WELL CEMENTING COMPANY
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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Sept. 22, 1958

Drillers will produce a 30,000-ft. well before 1965:

The industry is witnessing a 25,000-ft. record this year. That mark, however, won't stand for more than 2 years.

These and other significant drilling developments are stemming from unusual achievements in 1958, which explorers already are setting down as one of the greatest in recent times—despite the general slump (p. 129).

Two recent discoveries set the tone of the year's work: The world's greatest gasser at Berland River in Alberta and the first big oil producer in Arizona.

Western Kansas has a new discovery, probably will get more before the year is out.

Jackson, Shear, & Parker have completed 1 Bowles in Rawlins County for 120 bbl. daily. Production is from the Marmaton at 4,430-36 ft.

Discovery is 20 miles northeast of Llanos field and in the hot four-county region where a dozen wildcats currently are busy. The Llanos discovery is one of the year's significant finds in the Mid-Continent area.

▼ ▼ ▼

Other EXPLORATION spots to watch:

...Nebraska portion of Denver basin has extension well at Raymond Oil's 1 Petsch in Kimball County. Well flowed 900 bbl. daily from Dakota Cretaceous "J" sand. It's Kimball's second good discovery this year.

...Utah's Uinta basin is back in the news after a long silence. Great Lakes Oil's Stone Cabin wildcat in Carbon County flowed 5,000 M.c.f. of gas daily from 22 ft. of pay in Wasatch-Tertiary. Higher pay zones also are indicated.

...Carbon County, Wyoming, may have one of year's most significant finds in the Rockies. Oil shows are reported at Atlantic Refining-Fremont's O'Brien Springs discovery. It's importance: Shows of oil in the Tensleep.

...Dakota-Cretaceous play in New Mexico's San Juan basin looks better each week. Latest addition to trend is Skelly's wildcat west of Largo Canyon-Pictured Cliffs field. It flowed 8,000 M.c.f. daily.

...Nevada has its first new drilling project in months. A 6,000-ft. test is scheduled on Clark County's Arden Dome.

It's 5½ miles southwest of only other currently active well in the state.

...Elkhorn Valley of San Luis Obispo County, California, is due more drilling. Richfield plans a sixth attempt to find oil in the valley, which is separated from Midway-Sunset field by the Temblor Hills.

...The multipay gas field in Terrell County, Texas, is living up to predictions. Richardson & Bass 1 Goode has daily potential of 60,000 M.c.f. from Ellenburger at 13,578-14,803 ft. This is third producer for the new field.

▼ ▼ ▼

Put hydraulic rigs down as a coming development.

The first successful oil-well drilling rig to be powered by hydraulics has already drilled more than 20 wells, some of them producers (p. 92).

This pilot model is designed for only 3,000-ft. depths, but there's no physical limit to its principles being applied to deep-hole rigs.

Attractive features of the hydraulic rig:

It's operated by a 2-man crew...Has a built-in automatic driller...Has no chain drive, gear transmission, friction brake, or wire line...It can be torn down and moved quickly... Initial cost and operating expense are low.

▼ ▼ ▼

An unusual cooperative water flood is paying off in California's Dominguez field.

It's the first full-scale flood started in the state. Union and Shell as operators are independently flooding adjacent leases. A pool engineering committee sets amounts of water going into injection wells on each property.

The important feature: Four of the input wells are used to build a water barrier to protect against migration of oil across the lease line (p. 77).

A deal is brewing which may see Kerr-McGee buy Magnolia's gathering system in Seminole County area of Oklahoma.

Magnolia has wanted to dispose of the three 6 to 8-in. lines for some time in a move to increase efficiency of its Oklahoma operations. But talks with other buyers have fallen through.

Kermac is a natural buyer. Company earlier acquired the gathering systems of Gulf, Texaco, and Pure in same general area. Magnolia system handles about 6,000 bbl. daily from leases in six counties.

Organized independents may petition Tariff Commission for increase in duties on imported crude and products.

Action can be taken under new escape clause of Recipro-

cal Trade Act. It gives commission more leeway in recommending tariff raises.

Here's feeling of the independents: Revised defense amendment and administration's new quota plan for imports are too uncertain and indefinite to give protection.

Opposition to the proposed import-quota plan is also developing in other quarters. Texaco and Gulf officials have blasted the plan as unfair. They say it ignores the investments and risks taken abroad by Americans and gives others an unearned subsidy.

Automatic-custody systems will handle 80% of our crude production within 10 years, Journal survey finds (p. 54).

LACT systems have taken a sudden spurt in the last 12 months. Some 200 will be in operation by year's end.

The explanation: More reliable equipment and the big economies which installations have revealed.

▼ ▼ ▼

An interesting gas deal is in the making by which Texaco will commit gas reserves in Enville field, southwestern Oklahoma, to Transwestern Pipe Line Co.

But Natural Gas Pipeline will pick up the gas at Fritch, Texas, for sale in Chicago until Transwestern can build its line into Fritch to move the gas to California.

Also getting hot again is the Gulf Pacific pipeline to move Texas gas for unregulated direct sale to industrial customers in California.

Southern California Edison recently renewed offers to buy gas in the field from producers. Gulf Pacific, a TGT affiliate, would only perform a transportation service. No resale would be involved.

▼ ▼ ▼

Upcoming: A move by gas pipelines to press FPC for a substantial increase in their rate of return, now about 6%.

Current cost of money as indicated by recent sales of pipeline bonds shows need for a 7.5% rate of return.

FPC is getting its back up at prices being asked by gas producers for new sales to interstate pipelines.

A crackdown could come if initial prices in new contracts get much higher.

Until now FPC has taken position it has no power to impose price limit in certificate for a new sale.

Distributors challenge this in several court cases now pending.

The danger: FPC may change its position, impose price limits, and let the producers appeal to the courts.

A constitutional challenge is expected against the 2-cent increase in Louisiana's gas-gathering tax.

Pipelines have until October 30 to make first quarterly payment. They will pay under protest and later file suits to test the act's legality. If one protests, all will follow to protect their refund position.

Big question: If 2-cent increase is invalidated, what is status of original 1-cent levy? The fight could hamper future legislative efforts of the gas industry in Louisiana.

Refinery runs should climb 5 to 6% in 1959.

Reason: A 4-5% gain in demand created by a 4% gain in auto registrations, a 1.7% increase in population, and a 6% higher industrial production.

This is the prediction of Tidewater Vice President J. G. Jimenez made for the National Industrial Conference Board's marketing conference.

One warning: The hard sell and close control of costs will be even more important to insure a profit.

Look for refinery and marketing expansion to be one of the big results of Signal-Hancock merger.

The new Signal company plans to enlarge and modernize Hancock's Long Beach refinery, which was damaged by fire. In addition new plants will be built in the San Francisco area and in the Northwest.

Signal will use the Hancock brand name in its aggressive marketing plans for the western states (p. 52).

Esso Standard researchers have found a way to hydrodesulfurize fluid coke to 1%.

Low-temperature preoxidation is the secret. It makes later treatment with hydrogen successful. Oxidation is carried out at 650° F. Hydrogen treatment is at 1,400° F.

Stable market for domestic crude is forecast during the fourth quarter by IPAA.

The outlook: Domestic production 7 million barrels daily, natural-gas liquids 850,000 bbl. daily, and total oil imports 1,600,000 bbl. daily. This new supply will meet total domestic demand.

About 270,000 bbl. daily will be drawn from inventories to meet total demand, however. This drawdown equals the expected volume of exports.

Calendar of next Congress will include:

...Depletion. Review of oil and gas taxing policies is sure bet. Sentiment is growing to cut depletion allowance.

...Higher gasoline tax. Budget Bureau already has put out warning it is considering asking for a 1 or 2-cent hike to replenish highway trust fund.

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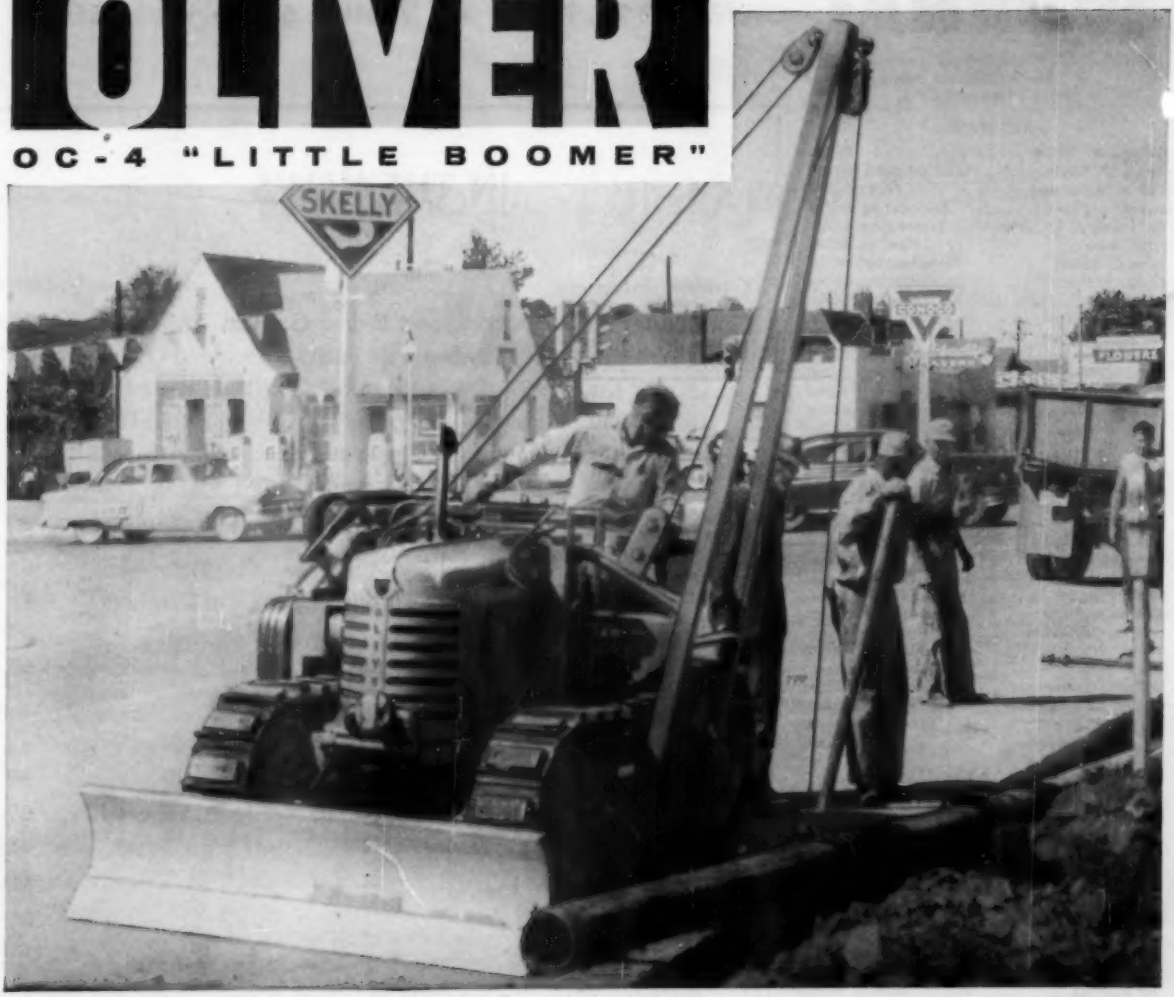
OLIVER

OC-4 "LITTLE BOOMER"



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TECHNOLOGY—OPERATION

Drilling-Production

California's Water Flood Pays Off 77

By D. H. Stormont

A cooperative project of Union Oil Co. of California, Dominguez Oil Fields Co., and Shell Oil Co. in a 125-acre pool in Dominguez oil field is proving that water flooding will work in the thick, dirty sands which characterize many California oil reservoirs.

Two-Man Crew Operates Hydro's New Hydraulic Rig 92

By Ed McGhee

This simplified drilling unit has successfully drilled more than 20 wells, some of them oil producers. It has successfully drilled on contract. It can be torn down, moved, and rigged up quickly. The rig drills to a depth of 2,500 ft. or below.

Pipelining

New Turbine-Type Meter for Custody Transfer 83

By Arthur B. Dunlop and C. Alan McCutcheon

Tests over a 3-year period for a high-capacity meter to be used in custody-transfer applications show acceptable accuracy. Three such meters are now in service and two more will be installed later this year.

Tough Ditching Slowed Progress on Cherokee Project 86

By Gene Kinney

The contractor on the 84-mile, 12-in. products line from Ponca City to Glennpool, Okla., encountered one special construction problem after another as his spreads moved through the Osage Hills.

Refining-Processing

Regeneration of Alkaline Solutions Used in Mercaptan Extractions 89

By B. C. Phenix, Jr.

A new method for the regeneration process maintains a water balance in the treating solution by increasing the regeneration temperature above the limit usually recommended for oxidizing of mercaptans. Removal of water is done simultaneously with the oxidation.

The Hot Potassium Carbonate Process for CO_2 Removal from Gas 99

By B. O. Buck and A. R. S. Leitch

Acid-bearing gases enter a contactor where they are countercurrently contacted by the carbonate solution. Treated gas is cooled and dehydrated before pipeline delivery. Carbonate solution from the contactor is regenerated and recycled.

The Economics of Acid-Gas Removal by Hot Carbonate 106

By A. G. Eickmeyer

Under favorable conditions of pressure and acid gas content, the initial investment in operating costs for a hot-carbonate plant is considerably less than for an amine plant. Main reason stems from the use of the hot-circulating solution for absorption. Heat exchangers are not required and less steam-generation and cooling equipment is needed.

Process Costimating 113

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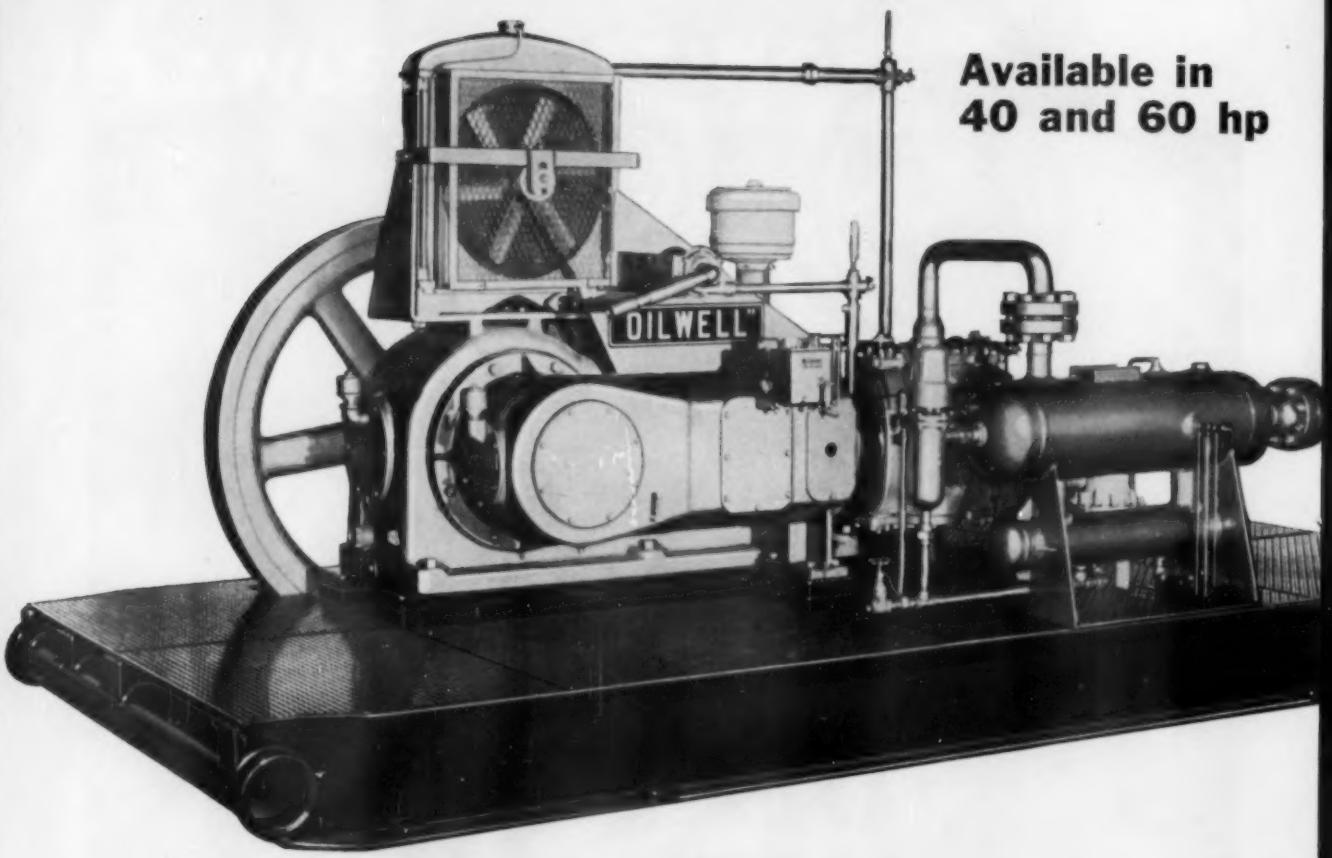

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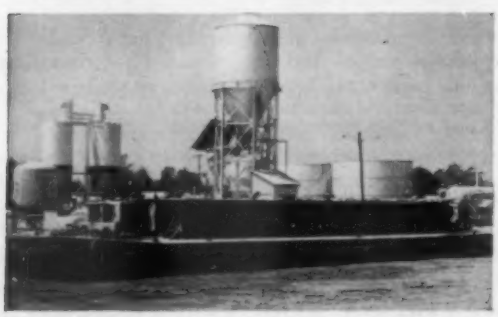

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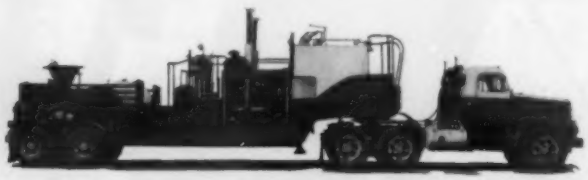

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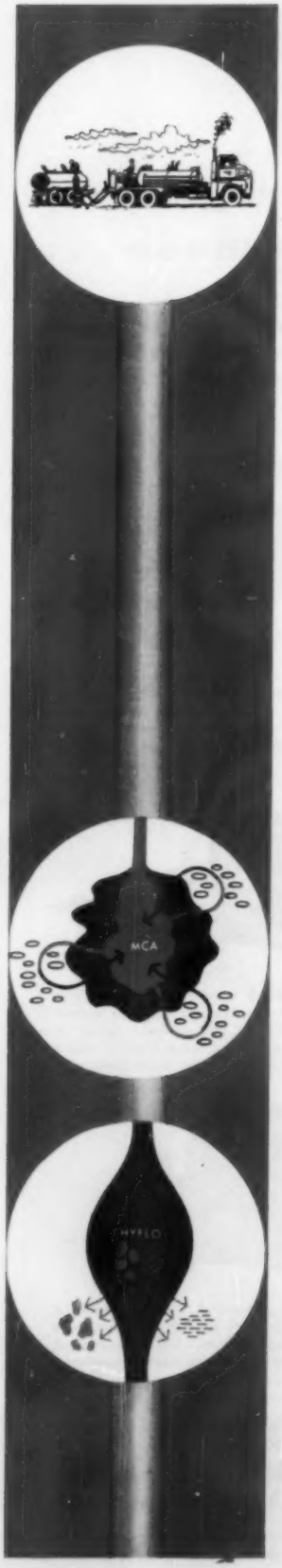

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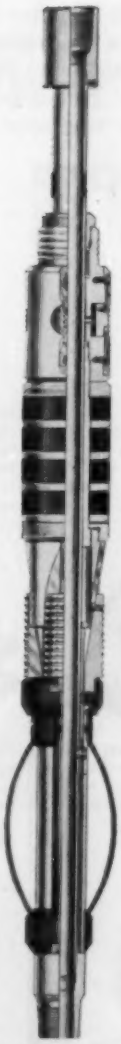

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With special Halliburton chemical additives is most effectively used in the treatment of limestone and dolomite formations to improve permeability. The reaction products are soluble, permitting the removal of the dissolved limestone or dolomite in the spent acid solution,

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The Halliburton "HV" (High Viscosity) Acid inherently delays reaction until the solution is at a greater distance from the well bore, with a resulting larger well drainage area. A comparable volume of "HV" Acid may cover from 4 to 9 times the drainage area of ordinary acid. Extremely useful for temporarily plugging highly permeable sections of well bore in old wells or those previously acidized.

"HM" RETRIEVABLE PACKER

Proper segregation of the zones to be treated is accomplished by means of a Halliburton Type "HM" Retrievable Packer. This versatile, rugged packer can be set again and again for treating different horizons at any point in the well.

*None of the above Halliburton chemicals contain arsenic or chlorinated hydrocarbons.

HALLIBURTON

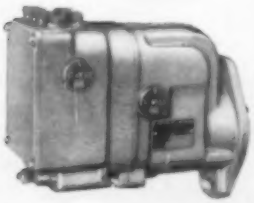
CHEMICAL SERVICES

284 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL

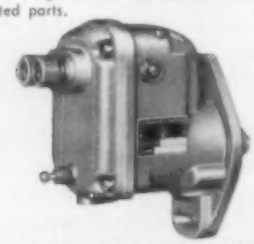
952

different sizes, shapes, and types of Fairbanks-Morse "SUPER-SPARK" Magnetos solve special ignition problems like these . . .

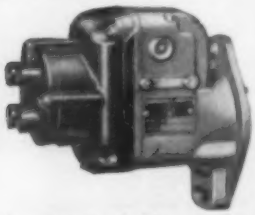
A better solution at lower cost — that's what you can count on when you bring special magneto problems to the Fairbanks-Morse engineers. They meet almost any need with existing components selected from nearly a thousand magnetos . . . keep manufacturing costs low, give you improved product performance with a Fairbanks-Morse Super-Spark Magneto precisely tailored to fit your equipment and operating conditions. Units shown below typify the range of F-M stock magnetos.



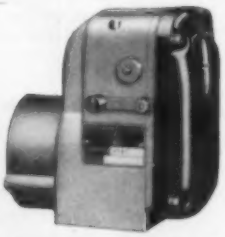
FM-E6—radio-shielded, designed for continuous heavy duty. Vented frames, CW or CCW rotation, base or flange mounting. For 4- or 6-cylinder engines. 180 deg spark interval, feed through condenser. Standard or fungus-treated parts.



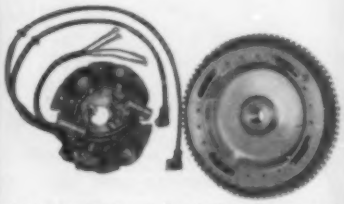
FM-PE1-2B—radio-shielded, 2-spark. Magnetic rotor, ball-bearing drive end, roller-bearing cam end. Single impulse coupling pawl, intense spark during starting, automatically retarded. 360 deg spark interval. Fungus-treated or standard parts.



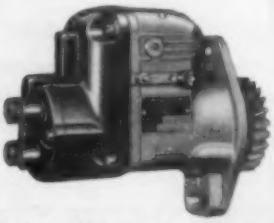
FM-X4B—outstanding ignition unit for tractor and industrial engines. Highly adaptable mounting, applicable to wide range of medium- to heavy-duty engines. CW or CCW rotation, 180 deg spark interval. Sealed or vented frame.



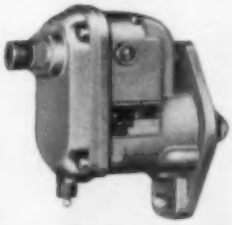
FM-X1A—base-mounted, available with 35 mm or 45 mm base plates. CW or CCW rotation, alnico magnetic rotor. Fungus-treated or standard parts, sealed or vented frame. Multiple applications.



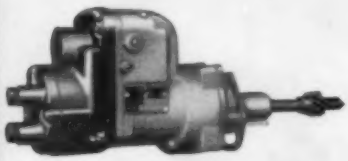
FM-WG2P87—9-inch flywheel magneto-generator. CW rotation, 180 deg spark interval. Designed to give dependable service on 2-cylinder engines. Charging unit delivers 5-amp charge to 12-volt system.



FM-ZV4B—4-pole rotor and 4-lobe cam produce ignition spark every 90 deg. Standard or special arrangement for extended drive shaft. CW rotation. Radio-shielded units available.



FM-PE1B—newly designed for high-speed single cylinder engines. Ball bearings on rotor drive end, roller bearings on rotor cam end. Simplified breaker point system. Radio shielded. 360 deg firing interval. Sealed or vented units, CW or CCW rotation.



FM-ZV4C—special vertical mounting. Impulse coupling gives retarded starting spark without backfire. CW or CCW rotation. Sealed or vented frames, 90 deg spark interval. Radio shielding available. For automotive type distributor.

FM-X1B—flange-mounted. Alnico magnetic rotor, CW or CCW rotation, 360 deg spark interval. Rugged dust- and moistureproof frame, vented or sealed to meet requirements. SAE flange or special flanges available for multiple applications.

Fairbanks-Morse MAGNETOS SALES SERVICE

SIGN OF SERVICE

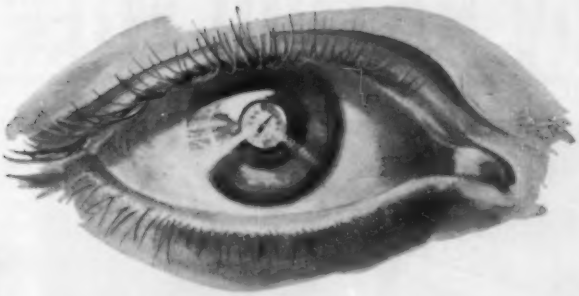
More than 2500 authorized service stations in America handle repairs, replacements, and parts-off-the-shelf for more than 4,500,000 Super-Spark Magnetos now in use!

Write: Fairbanks-Morse, Magneto Div., Beloit, Wisc.

FAIRBANKS-MORSE

A name worth remembering when you want the BEST

MAGNETOS • REWIND AND ELECTRIC STARTERS • WATER SYSTEMS • GENERATING SETS • PUMPS • MOTORS • SCALES • DIESEL LOCOMOTIVES AND ENGINES



What you read is right

The new, patented Maxivision dial on American Bi-Metal Thermometers eliminates the perspective effect of usual pointer-above-dial construction. No parallax! Readings are sure, sharp and accurate – exact working temperatures are always right before your eyes. It is a two-level dial. A raised outer ring, set close to the cover glass, carries the graduations. The index type pointer is on the same plane as the outer ring, with the numerals on a lower level.

What you read is right when American Bi-Metal Thermometers with anti-parallax Maxivision dial are installed at important check points on your processing facilities. Mounting styles, dial sizes, temperature ranges and stem lengths are available to meet the most exacting requirements. Let your nearby industrial distributor help you select the best combination for each location.

American Bi-Metal Thermometer with Maxivision Dial. Suitable for indoor or outdoor service.

MAXWELL MANNING MM&M MOORE TRADE MARK

A2-588

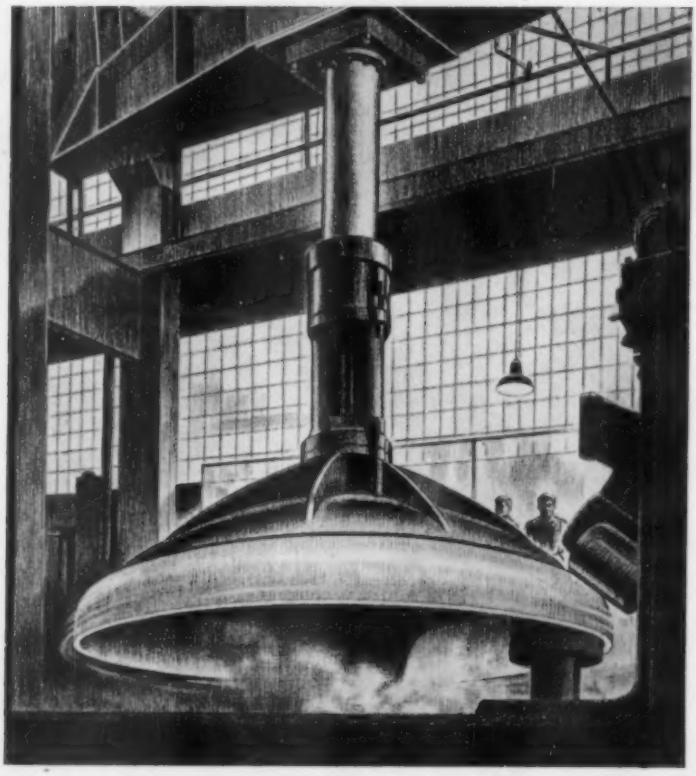
AMERICAN INDUSTRIAL THERMOMETERS

A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Spinning saves Metal —cuts tool costs



Dished and flanged end Rotarpress spun by Harveys greatly facilitate the design and production of Pressure Vessels of all kinds. These ends combine semi-ellipsoidal form with large knuckle radius, allowing a substantial reduction in plate thickness to be effected, and in most cases the preparation and cost of expensive tools is eliminated.

'ROTARPREST' ENDS FOR PRESSURE VESSELS

can be supplied in Mild, Alloy and Clad Steels and non-ferrous metals. The capacity of the Rotarpress ranges from 5 ft. to 15 ft. diameter and from ⅜ in. to 4 in. thickness; knuckle radii may be varied to meet individual requirements.

GET THE FACTS!

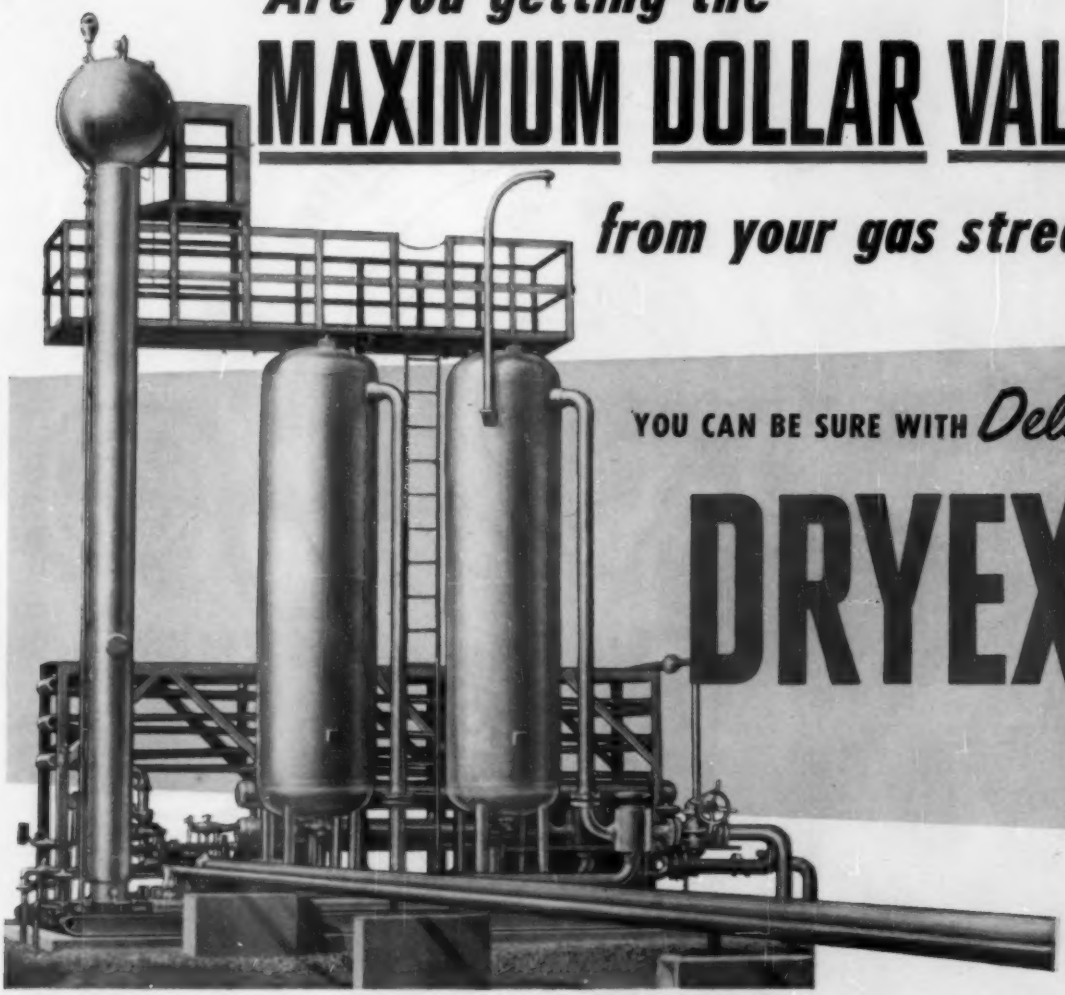
Our latest catalog gives details of the diameters and profiles to which 'Rotarprest' Ends can be produced, along with a table of tolerances and notes on the calculation of plate sizes for alternative flange depths. Send for Catalog No. OG 965.

Harvey.

G. A. HARVEY & CO. (LONDON) LTD.
WOOLWICH ROAD, LONDON, S.E.7. ENGLAND
Cables: 'Cheaper, London.'

SPECIALISTS IN THE PRODUCTION OF DISHED AND FLANGED ENDS FOR THE PETROLEUM INDUSTRY.

Are you getting the
MAXIMUM DOLLAR VALUE
from your gas stream?



YOU CAN BE SURE WITH *Delta*

DRYEX®

DE2-8

An adsorption process unit — tailored to your requirements

It's impossible to get maximum profits from your gas stream if you give away certain liquids that can now be recovered by DRYEX. A product of Delta Tank Manufacturing Co., DRYEX is a reliable, efficient unit for dehydration and gasoline extraction from relatively small and lean gas streams. It is a rapid-cycle, fully-automatic, self-contained, skid-mounted unit, already proven in actual lease operation. Let us analyze your gas stream to determine the value of the Delta DRYEX Unit to you. For complete technical information, contact your local Mid-Continent representative.

Mid-Continent Supply Co. is exclusive distributor world wide of Delta oil field equipment.

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

another Eastman contribution to saving drilling time and expense

Two punch marks reveal the drift . . . ACCURATELY!

Eastman engineering and research are responsible for this smallest of drift indicators . . . with patented self-checking features. Two punch marks are made on the record disc at the angle of drift of the well and exactly 180 degrees apart. If any motion of the instrument occurs during the recording period, the two marks will show different degrees of inclination and other than 180 degree spacing. This device for determining drift accurately is only one of the continuing Eastman developments in a unique program . . .

. . . dedicated to progress through advanced engineering . . . research . . . and service to the Petroleum Industry.

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ANOTHER **Vogt** FIRST

9 NEW FLANGED END FORGED STEEL

GENERAL GP PURPOSE

Gate, Globe and Check VALVES

with

HARD FACED SEATS

150, 300 and 600 ASA STANDARD

featuring:

ASA Standard flanges and face-to-face dimensions

*Stellite hard faced seats and hardened wedges and discs

Spiral wound body-bonnet gaskets

Stainless steel gland studs and nuts

Interchangeable parts

Light weight with maximum strength

Complete line—pressures, sizes and types

*Union Carbide Corp.

Vogt GENERAL GP PURPOSE Vogt FOR BETTER VALVES

FORGED STEEL

VALVES

HENRY VOGT MACHINE CO., BOX 1918, LOUISVILLE 1, KY.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J. St. Louis, Charleston, W. Va., Cincinnati

THE ONLY LARGE HELICOPTERS FULLY PROVED IN COMMERCIAL SERVICE ARE SIKORSKYS

HELICOPTER AIRLINES have set many records with Sikorskys in establishing passenger service in the U. S. and abroad. The S-58 above is one of a fleet of five operated by Chicago Helicopter Airways. The line has set a record for rapid growth of a helicopter airline, carrying its 100,000th passenger within 19 months of inauguration of service.

In day in, day out scheduled passenger operations of helicopter airlines and in heavy-payload industrial service, Sikorsky helicopters—and only Sikorskys—have thoroughly proved their reliability and versatility.

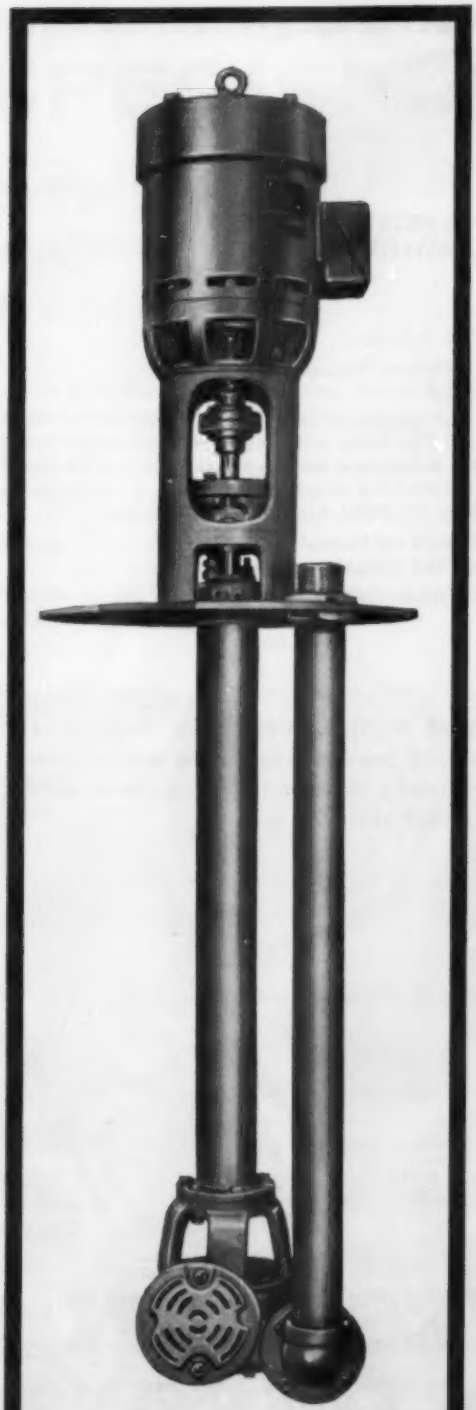
Aviation maintenance experts agree that the heavy demands of scheduled airline service provide a revealing test of aircraft performance and stamina. Commercial service is proof of excellence . . . and Sikorskys have led the way in the growth of all the major scheduled helicopter airlines, both in the U. S. and in Europe.

Industry too has used Sikorskys as passenger and cargo vehicles, and as flying cranes. The petroleum industry, for instance, has flown Sikorskys in the search for oil and as around-the-clock transportation to operating sites offshore, in jungles, and in other hard-to-reach areas.

Sikorskys have won a reputation for outstanding performance under difficult conditions, such as in scheduled service . . . and in the tropics, in deserts, in mountain areas, in polar regions, and at sea. If transportation is inadequate where you want to operate, Sikorsky helicopters may provide the answer to your problem. Write for information.

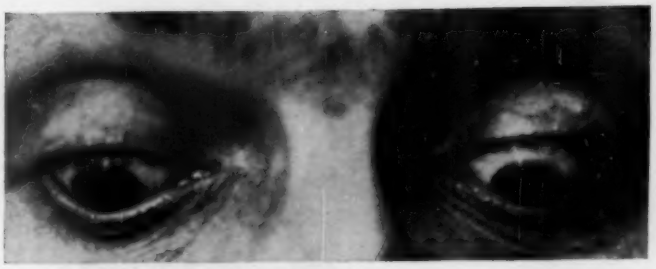
SIKORSKY AIRCRAFT
STRATFORD, CONNECTICUT
One of the Divisions of United Aircraft Corporation

RUGGED AND DEPENDABLE Sikorsky helicopters serve industry in many ways. Here an S-58 loads structural steel for flight to the mountain site of a high tension tower built by California Edison Company. Nearly 1,200,000 pounds of cargo were carried for the 68 towers erected, saving both time and the cost of road construction.



GOULDS

PUMPS FOR INDUSTRY



new way to pump corrosives

ANNOUNCING

a complete new group of vertical process pumps

How often would a vertical pump be just the ticket for transfer or other service . . . *except for the fact that you're handling a corrosive liquid?*

Now you can choose from a complete line of vertical process pumps especially built for heavy-duty service, pumping corrosive liquids. Goulds now offers a wide range of vertical pumps in highly corrosive-resistant materials.

Special constructions available. Standard construction of Goulds new vertical process pumps is 316 stainless steel . . . and other materials to meet your requirements are available on application.

Free bulletin. To discover all the outstanding features of this new line of heavy-duty vertical pumps, contact your nearest Goulds representative and ask for a free copy of Bulletin No. 727-1. Or write to Dept. OG-98, Goulds Pumps, Inc., Seneca Falls, N. Y.

Are customer-inspectors necessary – in heat exchanger fabrication?

APEX PETRO-CHEM CORP.
INSPECTOR'S REPORT

TO: Chief Inspector
FROM: Southwest Regional Inspector

I have just witnessed the final hydro tests on Items E-301, E-302, E-304 and E-305, and have approved them for immediate shipment. Western maintained its usual high quality.

Delivery is being made, incidentally, one week ahead of schedule.

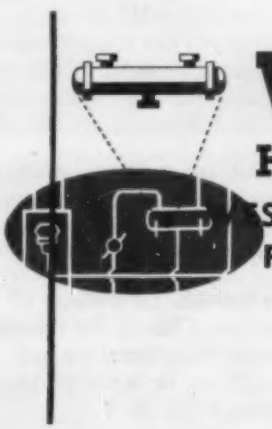
Question: Since heat exchangers fabricated in high standard shops are carefully inspected in accordance with A.S.M.E. Boiler and Pressure Vessel Code, as well as by the manufacturer himself, is it necessary for the customer to spend his own time and money in duplicating this work?

Answer: **No, it is not necessary. However, we recognize that all first-line engineering and operating companies are going to make inspections as a matter of policy, THEREFORE . . .**

. . . in the case of WESTERN, customer-inspectors are *welcome*, because it is from their reports and discussions that Western has acquired a reputation for the production of high quality heat transfer equipment throughout the petroleum and chemical industries.

Customer-inspectors, in other words, are Western's best salesmen.

Western's "open-door" policy to *all* customer-inspectors is worth investigating.



WESTERN
HEAT EXCHANGERS
STERN SUPPLY COMPANY
P.O. Box 1888 – Tulsa, Oklahoma

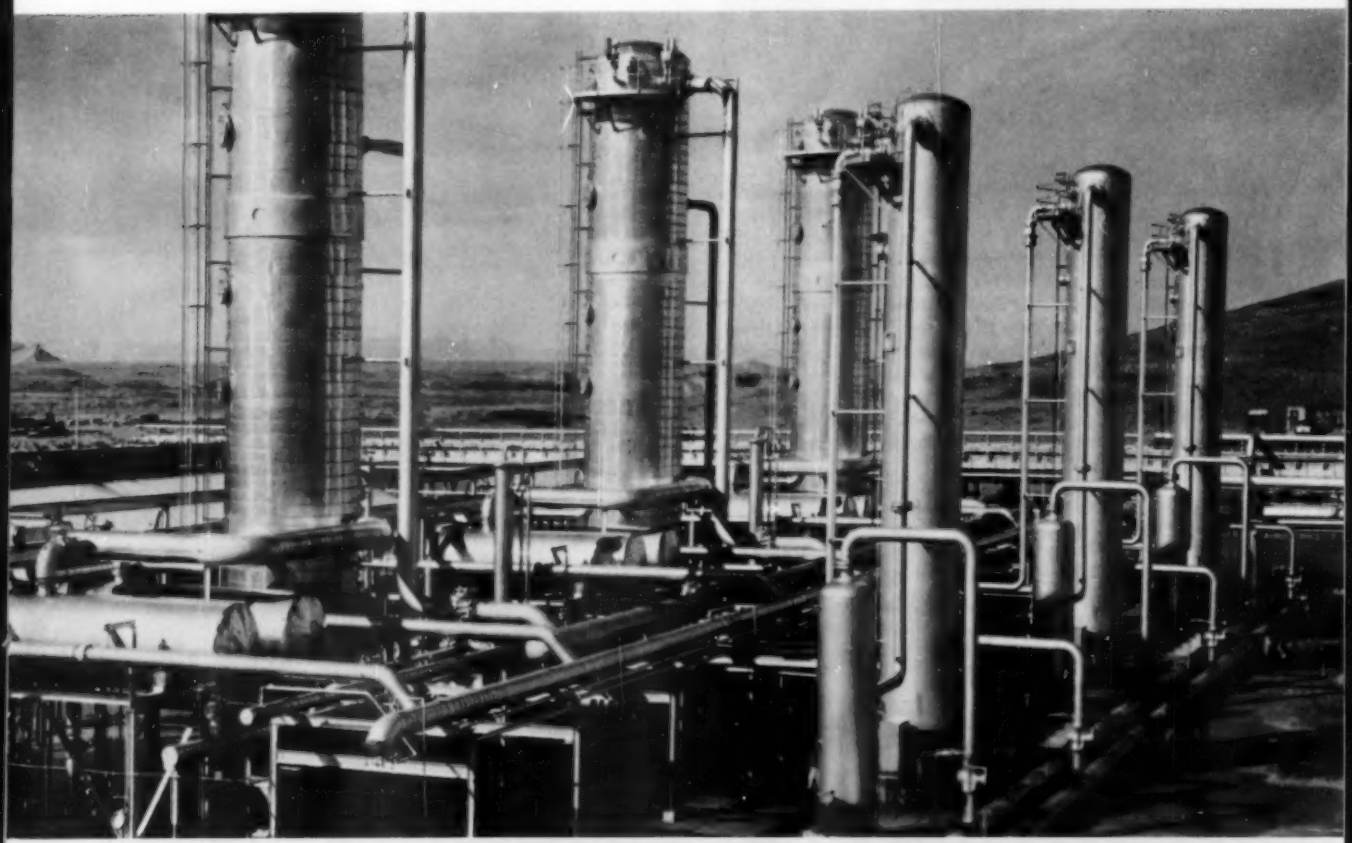
SPECIFICATION:

Process Equipment; Plant Structures; Transfer and Storage Equipment . . . shall be Alcoa Aluminum to resist corrosion

The one best answer to the process industries' problem of skyrocketing plant and equipment costs is to reduce corrosion damage. Fortunately there is a performance-proved way to do just that: specify Alcoa® Aluminum and ensure *corrosion-resistant* process equipment, transfer and storage equipment and plant structures.

No other metal matches the ability of aluminum to resist corrosive attack in so many operating environments. Happily, aluminum is usually the *least costly* metal able to serve satisfactorily in such situations. And aluminum, alone, provides the complete combination of important service benefits listed at the right.

Light Weight • Great Strength in Alloys • Good Workability • High Thermal and Electrical Conductivity • Nontoxicity • Good Reflectivity • Nonmagnetic, Nonsparking Characteristics • Clean, Attractive Appearance • Low Cost



On the following pages, you will find some of the many applications in which Alcoa Aluminum is daily being used to win the fight against corrosion in the process industries. Among them, you are sure to find ways in which *you, too,* can win this important battle.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

SPECIFICATION: *Process Equipment; Plant Structures; Transfer*

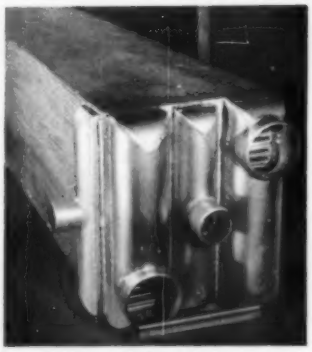
HEAT EXCHANGER TUBES

Low cost aluminum heat exchanger tubes combine initial equipment economies with freedom from chemical attack. Easy to fabricate, they have excellent thermal conductivity and are not subject to embrittlement at low temperatures.

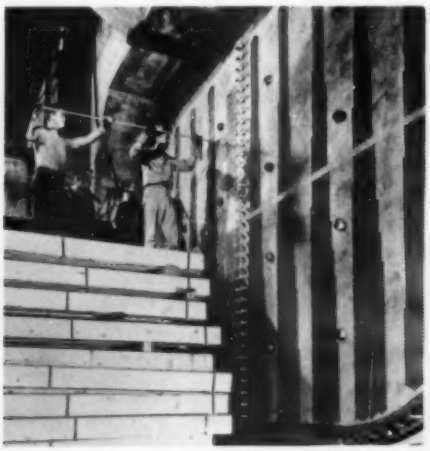
Aluminum tubes have thoroughly demonstrated their ability to give long-lasting, dependable service in severe operating conditions. They have been used extensively in exchangers handling hydrogen peroxide, nitric acid, hydrogen sulfide, naval stores, glycerine, ammonia, hydrocarbons, steam acrylonitrile and many other chemicals. Alclad tubes are recommended for use with natural cooling waters.

Remember, too, that aluminum costs far less . . . ½ the cost of admiralty, less than 1/5 the cost of stainless, and even less than mild steel in common ¾″ and 1″ sizes.

Write for booklet AD186 containing detailed information on heat exchanger tubes of Alcoa Aluminum.



This brazed aluminum assembly, weighing nearly 900 pounds, is typical of exchangers used in air separation plants and other low-temperature exchange processes.



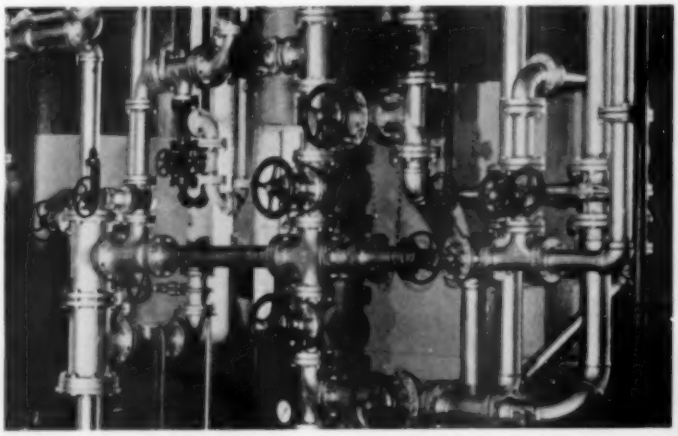
A 105,000 sq ft surface condenser with Alcoa aluminum heat exchanger tubes.

PROCESS PIPING

You get two-fold protection when you specify Alcoa Aluminum Pipe to carry liquids or gases in chemical, petrochemical, petroleum and food plants. It resists attack from the materials it carries as well as from corrosive atmospheres surrounding it. Naturally, the use of aluminum pipe will not introduce unwanted product contamination or discoloration.

Available in all normally produced schedules, Alcoa Aluminum Pipe is easily the lowest priced corrosion-resistant pipe available. For example, Schedule 40 aluminum pipe is ¼ the cost of Schedule 5 stainless and only 1/7 the cost of Schedule 40 stainless.

For more information, Send for booklet AD197, *Aluminum Pipe and Fittings*.

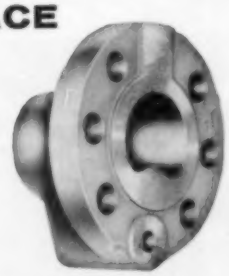


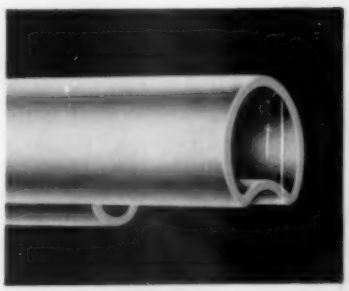
Alcoa aluminum pipe proved ideal to solve corrosion and product contamination problems in this processing plant.

UNITRACE

Only Alcoa makes available a complete line of components designed for Unitrace® which are compatible with conventional piping. With the recent addition of flange, Trace Cap, reducers and elbow fittings to the Unitrace line, it is now possible to design and install complete, fully integrated Unitrace steam-traced piping systems. Unitrace is the revolutionary steam-traced pipe of Alcoa Aluminum. Unitrace incorporates steam and product passages extruded in a single unit of aluminum alloy. It is available in diameters equal to 1½″, 2″, 3″, 4″ and 6″ pipe.

Get complete information on low cost, highly efficient Unitrace components. Write for Bulletin AD418.





New type Unitrace section showing trace line cut back for joint. (Right) Special cast Unitrace flange for easy, efficient joining of new type Unitrace sections.

ALUMINUM COMPANY OF AMERICA

Alcoa Building, Pittsburgh 19, Pennsylvania

and Storage Equipment . . . shall be Alcoa Aluminum to resist corrosion

Alcoa Standard Tanks provide storage economies for a wide variety of chemicals.

STANDARD AND SPECIAL STORAGE TANKS

Alcoa Standard Storage Tanks are fabricated from 3003 alloy and are available in both horizontal and vertical types in sizes ranging from 5,800 to 21,400 gallons. Because they are made with stocked components, they bring the user all the advantages of light, strong, corrosion-resistant Alcoa Aluminum at lower cost—with fast delivery.

Special storage tanks made of Alcoa sheet and plate can be constructed to meet specific requirements. Design and fabrication data will be furnished on request.

When you write, ask for Bulletin AD387, *Alcoa Standard Storage Tanks.*

World's largest all-aluminum tank stands 26 ft high, has a diameter of 128 ft, holds 2½ million gallons of 83% ammonium nitrate solution.

SHIPPING CONTAINERS

A wide variety of shipping containers conforming to ICC regulations is available from Alcoa. They range in size from 7½ to 110 gallons and are used to ship products ranging from beer to fuming nitric acid.

Lighter in weight than containers of other materials, Alcoa Aluminum containers are less expensive and give substantially longer service.

Aluminum exterior surfaces for buildings and conveyors provide pleasing appearance with minimum maintenance.

ROOFING, SIDING, STRUCTURALS & PAINT

Alcoa Industrial Building Products require practically no maintenance and serve well even when exposed to the corrosive atmospheres often encountered around processing areas. That explains the growing use of aluminum roofing and siding on plant buildings and outdoor equipment. Easily installed, it helps to keep construction costs low.

Alcoa also supplies structural shapes for use in construction where corrosion resistance and consequent low maintenance cost are advantageous.

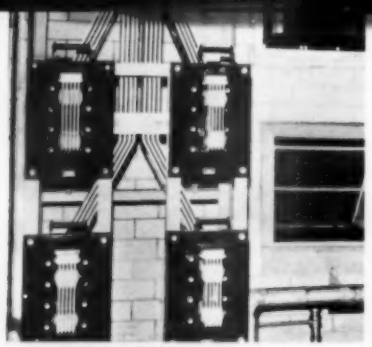
Paints pigmented with Alcoa Aluminum provide a continuous metallic sheet of pure aluminum for unmatched protective power. Where both color and protection are desired, Alcoa supplies nonleafing pigments to paint formulators.

Write for *Alcoa Industrial Building Products* booklet, AD285, *Alcoa Sandwich Walls* booklet, AD625, or *Painting with Aluminum* booklet, AD228.

ALUMINUM COMPANY OF AMERICA

Alcoa Building, Pittsburgh 19, Pennsylvania

SPECIFICATION: *Process Equipment; Plant Structures; Transfer and Storage Equipment . . . shall be Alcoa Aluminum to resist corrosion*



BUS BARS

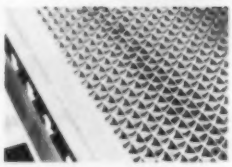
Excellent corrosion resistance, added to lowest cost per unit of current carrying capacity, makes aluminum ideal for bus bar use in process plants. Get complete information by writing for the Alcoa Bus Conductor Handbook, AD661.

NEW ALCOA EXPANDABLE TUBE-IN-SHEET

Here's a brand new way to bring the outstanding corrosion resistance of Alcoa Aluminum to heat transfer operations. It's Alcoa Expandable Tube-in-Sheet. To produce it, Alcoa has perfected and greatly amplified a revolutionary process for creating tubular shapes as an integral part of aluminum sheet and plate.

These unique, one-piece units of aluminum sheet or plate contain a series of lengthwise, parallel areas that can be expanded hydraulically or with air to form integral tubes in a variety of shapes. Without complicated joining or fabricating, the product is ideally suited to solving heating and cooling problems found in many industrial processes.

Expandable Tube Sheet is available in all nonheat-treatable alloys and in heat-treatable alloys 6061, 2024 and 7075. It is shipped unexpanded in mill finish coiled or flat sheet. Get full information today.



GRATING, STAIR TREADS AND TREAD PLATE

Corrosion-resistant grating-type Alcoa Aluminum stair treads need no paint. They are available in all standard sizes at a price competitive with galvanized steel with abrasive nosing. (Write for Bulletin AD679.)

Aluminum grating is used widely for floors and walkways in and around processing plants because of its light weight, resistance to corrosion, low maintenance and nonsparking characteristics.

Alcoa supplies both a standard aluminum tread plate and Alcoa Abrasive Tread Plate. The latter has a self-renewing, bonded abrasive surface for extra nonskid protection. Write for Bulletin AD596.

ALCOA ENGINEERS WILL HELP YOU WIN THE FIGHT AGAINST CORROSION!

For over 40 years, Alcoa has worked with all segments of the process industries to develop a tremendous variety of applications in which aluminum can be used successfully to resist corrosion. That effort has resulted in an immense fund of practical nonconfidential information covering corrosion characteristics of many materials and processes under a variety of conditions. You can obtain this information without cost or obligation simply by writing Alcoa at the address given below.

When writing, state your requirements as specifically as possible . . . so that Alcoa's development engineers may supply you with the best data.

Write today! Join the thousands who have found Alcoa Aluminum their most important ally in the constant battle against the high cost of corrosion in the process industries.

THIS FREE BOOK

contains 80 pages of detailed data on the performance of aluminum in hundreds of applications throughout the process industries. It provides exact information on the behavior of aluminum with specific materials . . . along with complete design and specification information. Use it as your guide to the proper use of corrosion-resistant aluminum in your plants and equipment. When you write, ask for *Process Industries* Book, AD460.

Aluminum Company of America
904-J Alcoa Building, Pittsburgh 19, Pa.

Please send me the following literature (see above for booklet nos.):

_____

_____

_____

Name _____

Company _____ Title _____

Address _____

City _____ Zone ____ State _____

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Fine Entertainment
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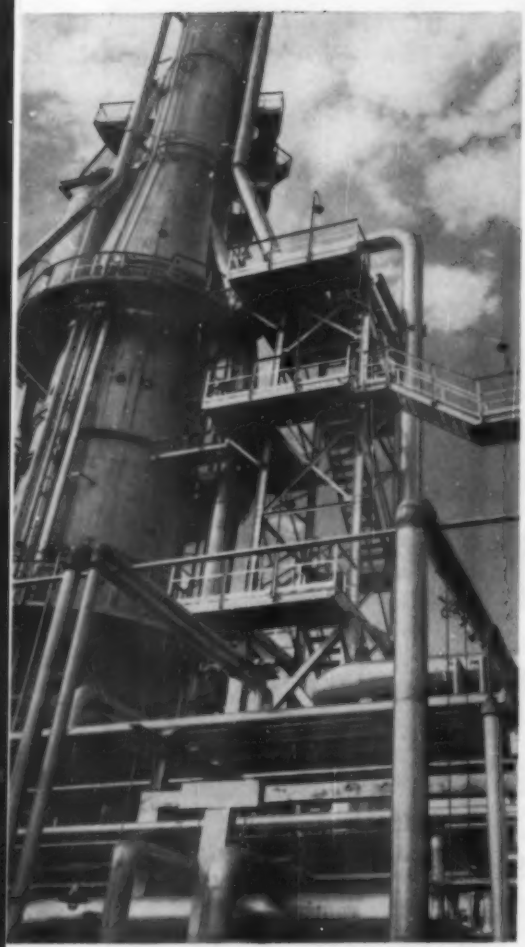
Form 68-11118

Now Shell offers two packages to boost octane

Either process removes mercaptans almost completely at a cost of only a fraction of a cent per gallon. You save enough in TEL to pay this sweetening cost several times over. The same TEL dosage goes farther—gives you extra octanes cheaper than any other way. Both processes are now available for license. To find out which process is best for your operation, write Shell Development Company, 50 West 50th Street, New York 20, New York.

SHELL DEVELOPMENT COMPANY



You say you have an acid problem?

If your refinery acid problems are so bad that they're creating acid problems in your stomach, maybe you'd better get in touch with National* Tube. We can't give you medical advice, but we can sure straighten out your refinery tubing problems. You see, we *specialize* in finding ways to combat acids, corrosion, high temperatures, high pressures, and oxidation.

Our experience in this field comes from over 60 years of collecting data on the solving of tough refinery tubing problems. We've used this data to develop 24 different steel tube analyses—each one the answer to a specific set of refinery conditions. These analyses have been proved over and over again in actual service.

Besides the 24 analyses shown here, we have other chemical compositions in tubular products available. And we're presently studying a variety of temperature problems.

National Tube's Mill Service Force, available for field consultation, will be happy to help you find the right alloy, at the right price, to meet your needs. Just write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

Here are National Tube's two dozen different tube analyses:

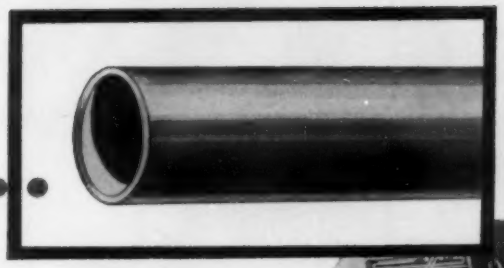
Carbon	5 Cr, ½ Mo	17 Cr
Carbon, ½ Mo	5 Cr, ½ Mo, 1½ Si	18-8 (18 Cr, 8 Ni)
1 Cr, ½ Mo	7 Cr, ½ Mo	18-8 Ti (18 Cr, 8 Ni)
1¼ Cr, ½ Mo	8 Cr, ½ Mo	18-8 Cb (18 Cr, 8 Ni)
2 Cr, ½ Mo	8 Cr, 1 Mo	18-8 Mo (18 Cr, 8 Ni)
2¼ Cr, 1 Mo	9 Cr, 1 Mo	25-20 (25 Cr, 20 Ni)
2½ Cr, ½ Mo, ¾ Si	12 Cr	3½ Ni
3 Cr, 1 Mo	12 Cr, Al	5 Ni

"The world's largest and most experienced manufacturer of tubular products
NATIONAL TUBE"

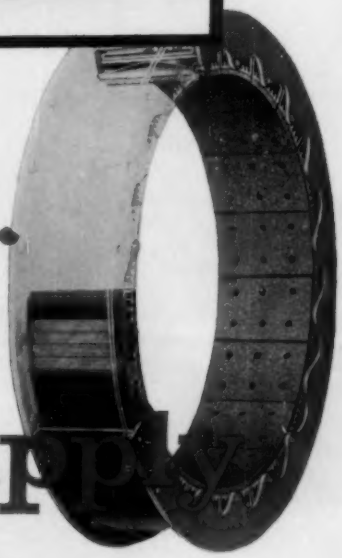
National Tube
Division of USS United States Steel
*TRADEMARK

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Supply Division
United States Steel Export Company, New York

Casing...



Clutches...



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Mack trucks set the pace in oil-field hauling. H. J. Jeffries' fleet containing 42 Macks carries bulky oil-field equipment and heavy machinery to oil fields in the Southwest. Mr. Jeffries has found, as have many other operators, that . . .

One MACK *leads to another*

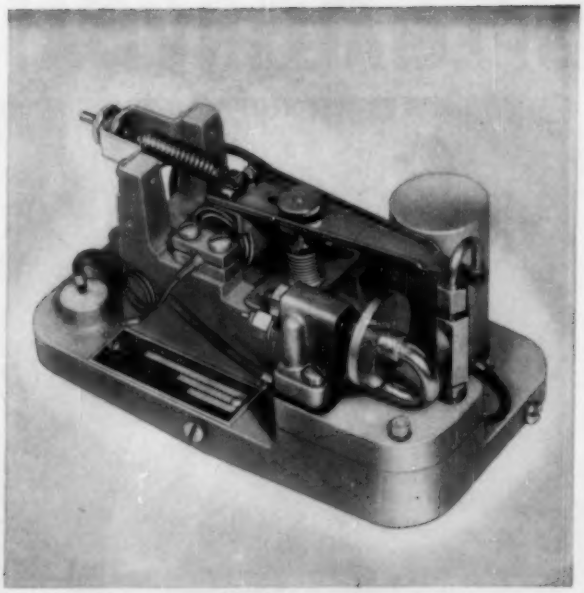
You can assure more dependable oil-field operations when you rely on Mack trucks to do your hauling. They have the strength and flexibility to haul heavy, cumbersome equipment over the open highway as well as overland into isolated drilling sites. Mack's Balanced Bogie with Power Divider (which applies torque only to the wheel with traction) allows Mack trucks to move the heaviest loads over rough oil-field terrain—helps assure on-time deliveries under extreme weather and road conditions.

Low-cost operation is another important reason why Mack trucks are so well-suited for oil-field service. Economy-conscious haulers have found that Mack's ability to haul maximum payloads at low operating costs, with low down time and minimum maintenance requirements, mean consistently profitable operation, day after day, month after month.

Contact your nearest Mack branch or distributor for the names of nearby Mack users to get on-the-job proof of Mack's economy and dependability—the best reasons we know why one Mack leads to another. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

LOW COST AND EASE OF INSTALLATION PERMIT WIDE USAGE.



OPERATIONAL SIMPLICITY IN A RUGGED, COMPACT UNIT.

TAYLOR ANNOUNCES NEW LOW-COST TEMPERATURE TRANSMISSION

New SENSAIRE* Transmitter: rugged, compact, force-balance, with mercury-filled system. Self-compensating for ambient temperatures.

The new Taylor SENSAIRE temperature transmitter now makes more widely available low cost temperature measurement within limits of minus 30°F. to plus 1200°F., with simplified adjustments and excellent repeatability.

Individual transmitters are factory calibrated in one of four available range spans. A simple thumb-screw adjustment zero-sets the instrument within wide limits. This adjustment is accomplished with high accuracy, and no further calibration is necessary. Factory calibrated accuracy is well within 1% of rated range, below 550°F; 1½ % above 550°F.

All SENSAIRE transmitters and components are interchangeable (regardless of range). A measuring system encompassing a new range span or new range limits (other than those obtainable with zero adjustment) may be added in the field.

Write for SENSAIRE **Bulletin 98293,** or see your Taylor Field Engineer, Taylor Instrument Companies, Rochester 1, N.Y., or Toronto, Ontario.

*Trade-Mark

Taylor Instruments
MEAN ACCURACY FIRST

Unusually Fast Response. Due in part to its extremely small bulb, the SENSAIRE transmitter has an unusually fast speed of response. However, for processes that require it, the SPEED-ACT* (derivative response adjustment) unit is available. The SPEED-ACT feature is of special value where the bulb is placed in a well, or in processes using material with poor thermal transmission rates.

Easy to Install. Mounts in any position. Universal bracket provides for direct mounting on pipe, wall, or wrench head of well or separable bushing. Small and extremely compact, the SENSAIRE transmitter measures only 7¾" x 4¾" x 4½"; weighs only 7 lbs.

SPECIAL INVITATION TO YOU . . .

Shop at your SUPPLY STORE for AMERICAN IRON products!

It's a good idea to shop and buy ALL your equipment and necessary services through your SUPPLY STORE. This important part of our Oil Industry . . . the SUPPLY STORE, stands ready to serve you day by day, twenty-four hours a day, courteously and efficiently.

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BE SURE IT'S THE BEST . . . SPECIFY AMERICAN IRON

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FOR THE SWING TO

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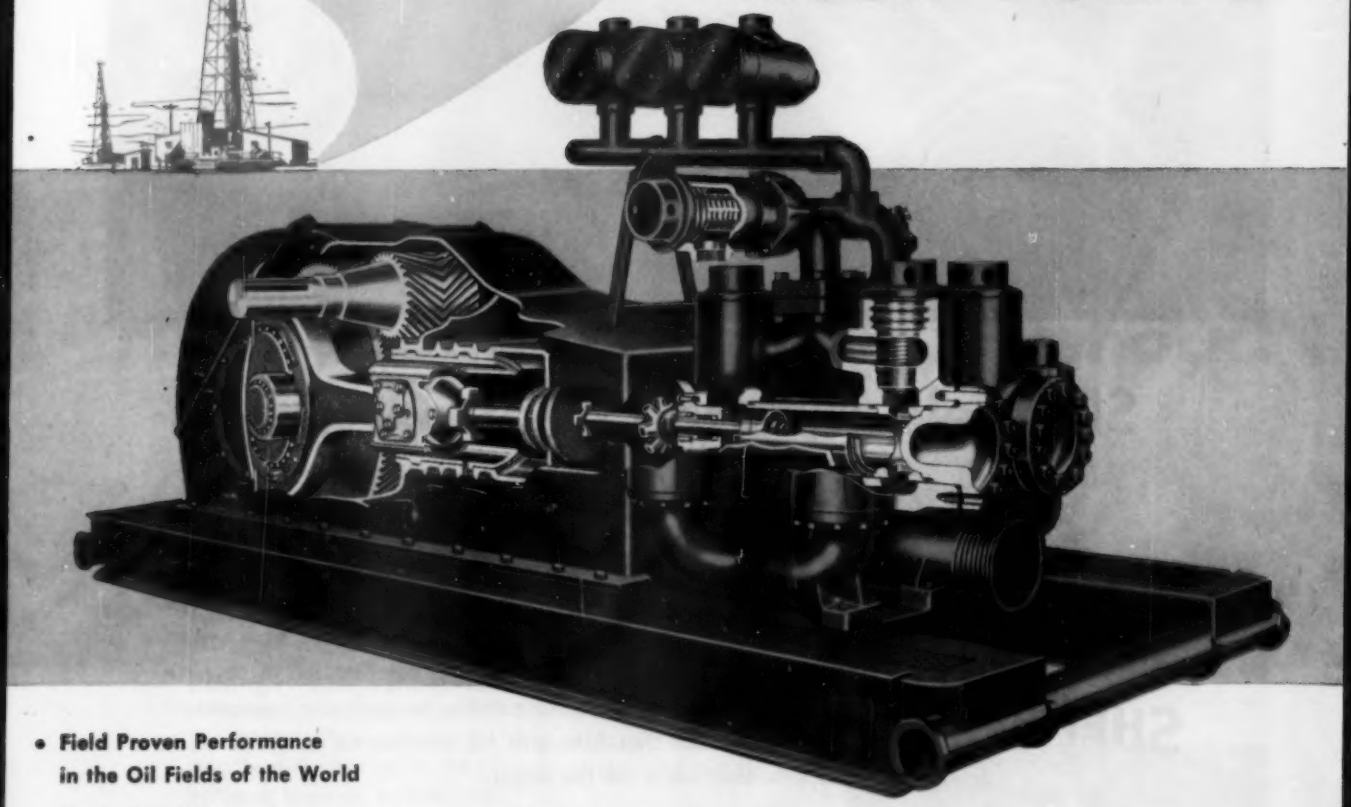
SLUSH PUMPS



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- **No Daily Adjustments**
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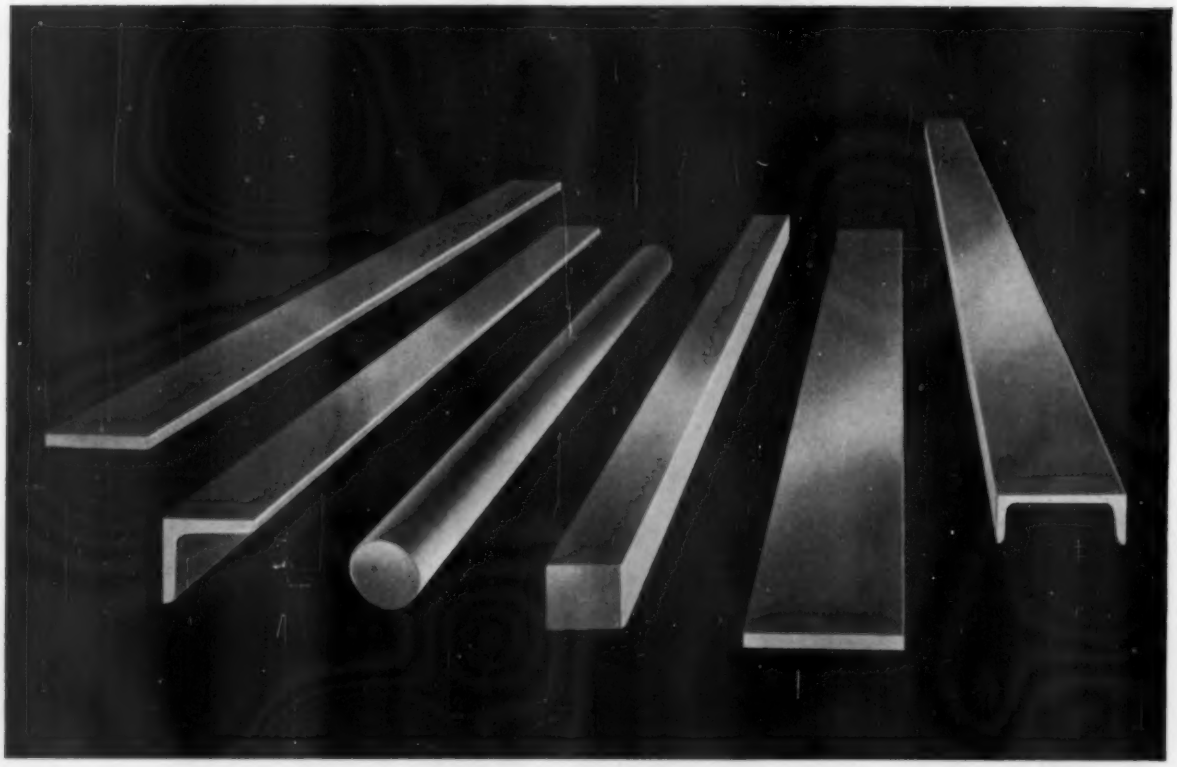


Sheffield puts the heat on steel to give you better alloys

SHEFFIELD
ARMCO

Heat-Treated Carbon and Alloy Steels

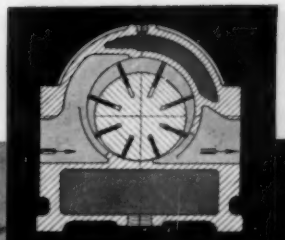
Heat-treating plays a big part in "tailoring" alloy steels to specific needs. Through closely controlled temperature, time and atmosphere it produces in steel the right combination of strength, hardness, ductility and machinability to meet any requirement. From drill bits that bite into oil reserves six miles down, to rockets that reach for the moon.

The latest in heat-treating facilities are now in operation at the fully integrated Sheffield plant in Houston. As the leading western producer of alloy steels, Sheffield has the metallurgical know how to help you determine the exact grade of steel and heat treatment to meet your product need at lowest cost. And Sheffield has the production facilities to make it for you fast.

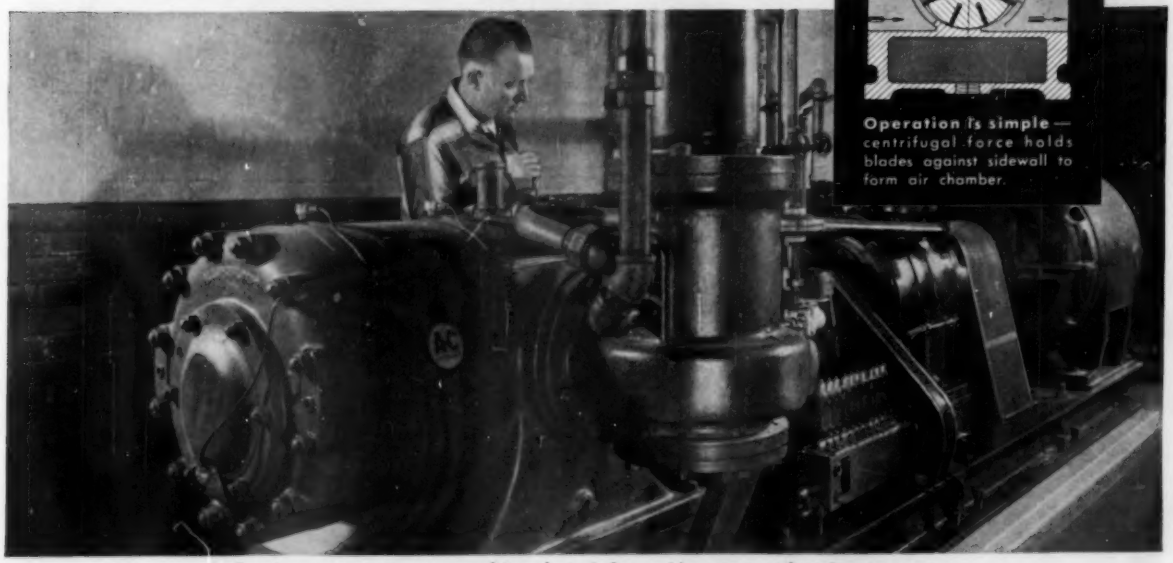
You're invited to consult our technical staff.

SHEFFIELD DIVISION ARMCO STEEL CORPORATION SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

Ro-Flo COMPRESSORS



Operation is simple—centrifugal force holds blades against sidewall to form air chamber.



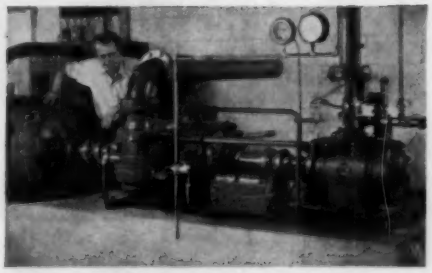
Two-stage rotary compressor supplying plant air for a midwestern manufacturing company.

No shake...no shimmy...no shock!

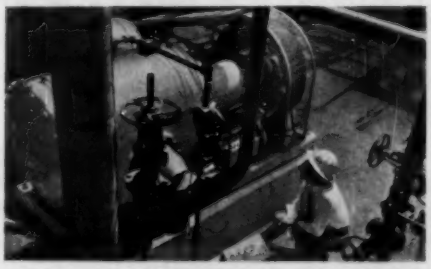
Rotary operation produces a remarkably stabilizing effect. You don't get the shimmy and shock inherent in reciprocating compressors.

Users in many industries have discovered that *Ro-Flo* compressors eliminate the cost of heavy foundations. A simple slab is enough. Smaller units are bolted directly to the floor. Automatic wear compensation at the rotor blades keeps compressor efficiency at high level even after years of use. There are only two wearing parts.

Ratings—Choose from twelve sizes of two-stage *Ro-Flo* compressors, ranging from 250 to 1800 cfm at pressures from 60 to 125 pounds gauge. Single-stage *Ro-Flo* units handle pressures up to 50 pounds gauge, and handle volumes from 40 to 3000 cfm.



Two-stage rotary compressor used for plant air service in a midwestern plant.



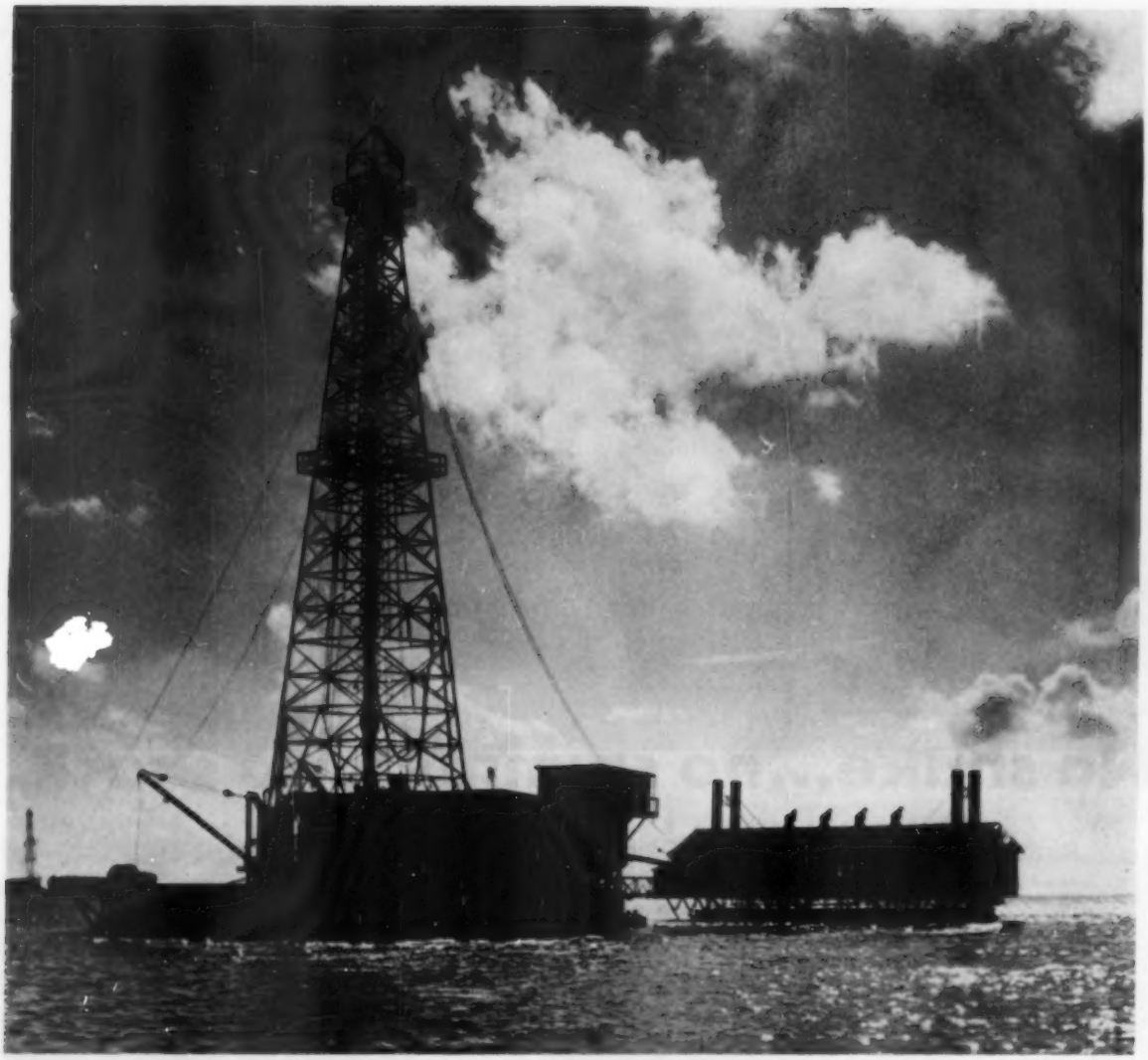
Ro-Flo hydrogen compressor in a southwestern plant, used here in conjunction with acrylic monomer process.

For complete information on Allis-Chalmers rotary compressors, ask for two-stage Bulletin 16B8244 or single-stage Bulletin 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5713



Parkersburg *Galemaster*

Symbol of Leadership in Derricks

Parkersburg, through imaginative engineering, gave the petroleum industry the first bolted portable derrick in 1899. Since then the name Parkersburg has been synonymous with derricks designed to meet the needs of a growing industry.

The new Parkersburg Galemaster continues in this tradition of first in derricks engineered for maximum safety and performance. In the tidelands that are sometimes raked with hurricanes and on deep holes everywhere, Parkersburg Galemaster is first choice of drilling rig operators.

THE PARKERSBURG RIG AND REEL CO. — PARKERSBURG WEST VIRGINIA — MADE IN U.S.A.

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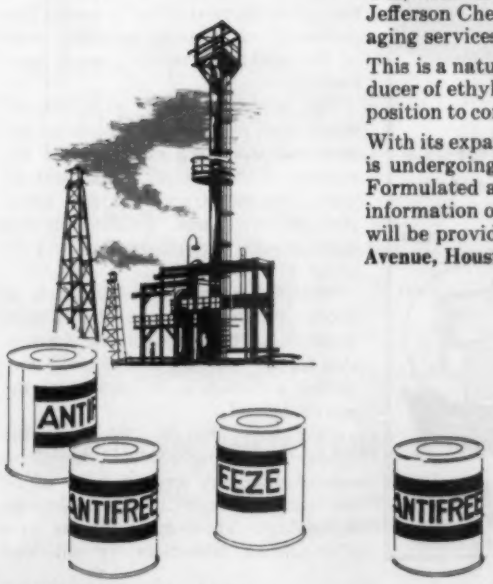
Drilling and Specialties Division Office:
P. O. Box 1160, Parkersburg, West Virginia



Yes, with its new ethylene glycol plant and consequent expanded capacity, Jefferson Chemical offers bulk formulated antifreeze as well as complete packaging services for private label customers.

This is a natural extension of Jefferson's activities in this field. A leading producer of ethylene glycol since the company was formed, Jefferson is in an ideal position to control product quality from raw material to formulated antifreeze.

With its expanded plant facilities nearing completion, Jefferson Chemical Co. is undergoing a program of diversification and new product development. Formulated antifreeze is one step in Jefferson's expanding future. Complete information on the company's formulated private label antifreeze "package" will be provided upon request. **Jefferson Chemical Company, Inc., 1121 Walker Avenue, Houston 2, Texas.**

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Ethylene Oxide, Glycols, Dichloride • Ethanolamines • Morpholine • Piperazine • Polyethylene Glycols • Nonyl Phenol • Surfonic® Surface-Active Agents • Ethylene Carbonate and Propylene Carbonate • Caustic Potash • Caustic Soda • Soda Ash • Sodium Bicarbonate

Essential Chemicals From Hydrocarbon Sources

They Say—

Drilling where oil ain't

Dear Sir:

I have enjoyed your articles about the Palo Duro basin. I made the Borger boom and have been in the oil business for the past 30 years—production, pipeline, and now marketing.

I have watched the drilling of wildcats in the basin over a period of several years and it seems to me that all of them are off structure.

I am of the old school and was brought up to think in terms of the top for likely places to drill . . . most of the older fields were discovered in this manner. For this reason, I believe that an old-time surface geologist can pick a good location in the Palo Duro.

There is a structure in the Tulia area but it runs NW and SE and follows the North Tule Creek and there is a surface high east of a location that Frankfort is now drilling.

It makes you think that maybe the old farmer is sometimes right in his thinking when he says that they want to drill where it ain't and not where it is.

If you see anyone that wants to drill in the Palo Duro and find oil, send them around.

C. L. Craig
Craig Oil Co.
Plainview, Tex.

Who's qualified to import?

Dear Sir:

It is sickening to me to see the various headlines appearing in the newspapers and other publications at this time whereby certain political pressure is applied to revise the present import quotas on crude oil and finished products.

Of all the 62 refiners that have made application for import quotas for the first time, not one of these companies has ever invested one dollar in developing or producing one barrel of oil in a foreign country.

It is only fair that the companies that have invested in development of oil in foreign fields should be shown first consideration. Second consideration should be shown to other refiners who are located in an area where the type of crude they desire is not readily available.

It is my sincere opinion that the top level management of the companies now producing in foreign countries are better qualified in the handling of imports than a lot of politicians that have not one iota of an idea how to approach this problem and are only catering to certain lobbyists.

The development of foreign production is a safety valve for our own economy and protection, as it gives us the opportunity to preserve the reserves of this country should an emergency arise.

Victor E. Milch
President
TRANSAMERICAN FACTORS, Ltd.
Los Angeles

Caught in the wrong straits

Dear Sir:

Having had occasion to scan the pages of the September 1 issue of your Journal, please note error on page 220 in item titled "Drilling Begins at Maritime Site." "Newfoundland Strait" should be "Northumberland Strait."

The bodies of water bordering this province of Canada are Northumberland Strait on the north and the Bay of Fundy on the southeast.

An ex-Canadian

Encouraging the oil search

"Even the most pessimistic forecasters of our industrial trends expect the use of oil in the United States to double within the next 15 to 20 years. The growth in oil demand in other parts of the world will be even more spectacular.

"To keep abreast of expected demand and provide a cushion of reserve oil-producing capacity for the security of the nation, in the next 10 years, our industry should drill about 700,000 new wells. Drilling on this scale would require expenditures of about $75 billion . . .

"Despite the occasional prophets of doom, the industry in the United States is in business for the foreseeable future—so long as economic conditions are such as to encourage the search for oil.

"We have the oil. We have the means of finding oil, and the methods of discovery and recovery of oil are being constantly improved through technology. Most important, we have 170 million customers for oil—and

customer reports prove

Big Savings

with OCECO V-130 Conservation Regulators

Exclusive construction assures tight leak-proof closure fully up to operating setting—quick opening—and extremely high flows even at low pressures.

Oceco V-130 Conservation Regulators provide greater flow capacity, size for size, and pressure for pressure, specially at low pressures than ever available before. Our exclusive construction prevents vapors from escaping at less than set operating pressures. Flexing of the membrane peels off any icy formations, preventing freeze-ups. These valves bring never before secured all weather economy and dependability to the conservation of volatile products stored in cone, round, flat, lifter or expansion roof tanks. Write for Bulletin No. 552. It gives full details!

Patent Applied For.

PRESSURE BALANCED CONSTRUCTION

Tank pressures exerted on both sides of the membrane keep membrane under tension—assures tight seating fully up to operating setting—and positive flexing that peels away icy formations preventing freeze-ups.

EXCLUSIVE OCECO FEATURE SAVES YOUR VAPOR DOLLARS!

THE JOHNSTON & JENNINGS CO.

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New

North Texas

Geological Study

THE GEOLOGY AND GEOPHYSICS OF COOKE AND GRAYSON COUNTIES TEXAS

Published jointly by the Dallas Geological and Geophysical Societies, a 200 page report covering regional geology and tectonics; a history of the discovery, development and production of principal fields; stratigraphic and sedimentary characteristics; core analysis data; regional gravity; and the application of the reflection seismograph.

PRICE $10. Order from Dallas Geological Society, 6923 Snider Plaza, Dept. 1, Dallas 5, Texas

PETCO

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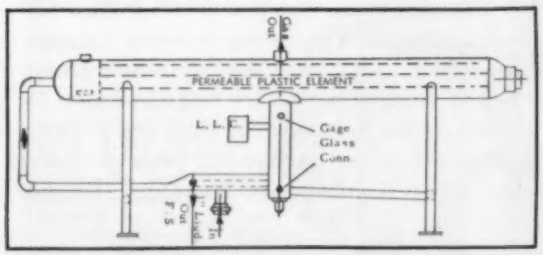

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★ Permeable Plastic Separating Media
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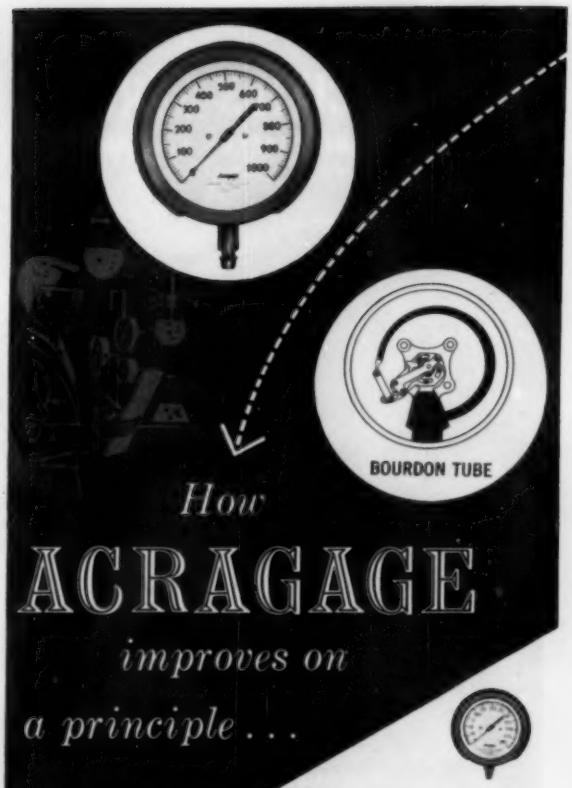

How
ACRAGAGE
improves on a principle . . .

Acragage's reputation for high accuracy and dependability is a result of continuous research and development. The Bourdon Tube, ("heart" of Acragages) was patented over a hundred years ago. Acragage technicians, however, have always felt that if anything is good, research can make it better.

The result is a Bourdon Tube which is 10% to 15% longer than those in general use. Heavier walled tubing is used in its construction enabling the tube to operate well below its elastic limits. Sustained accuracy, increased repeatability, and greater over-pressure protection are provided with Acragage's longer Bourdon Tube. Acragage Bourdon Tubes are available in Phosphor Bronze, Alloy Steel, Stainless Steels, and Monel.

Improved Bourdon Tubes are only one of many features that have made Acragage the choice of technicians and engineers who demand the finest in gages. **Mail coupon for more information and catalog.**

ACRAGAGE GIVES YOU MORE GAGE PER DOLLAR

- VACUUM GAGES
- PRESSURE GAGES
- COMPOUND GAGES
- TEST GAGES
- ELECTRIC TRANSMITTER GAGES
- PNEUMATIC TRANSMITTER GAGES
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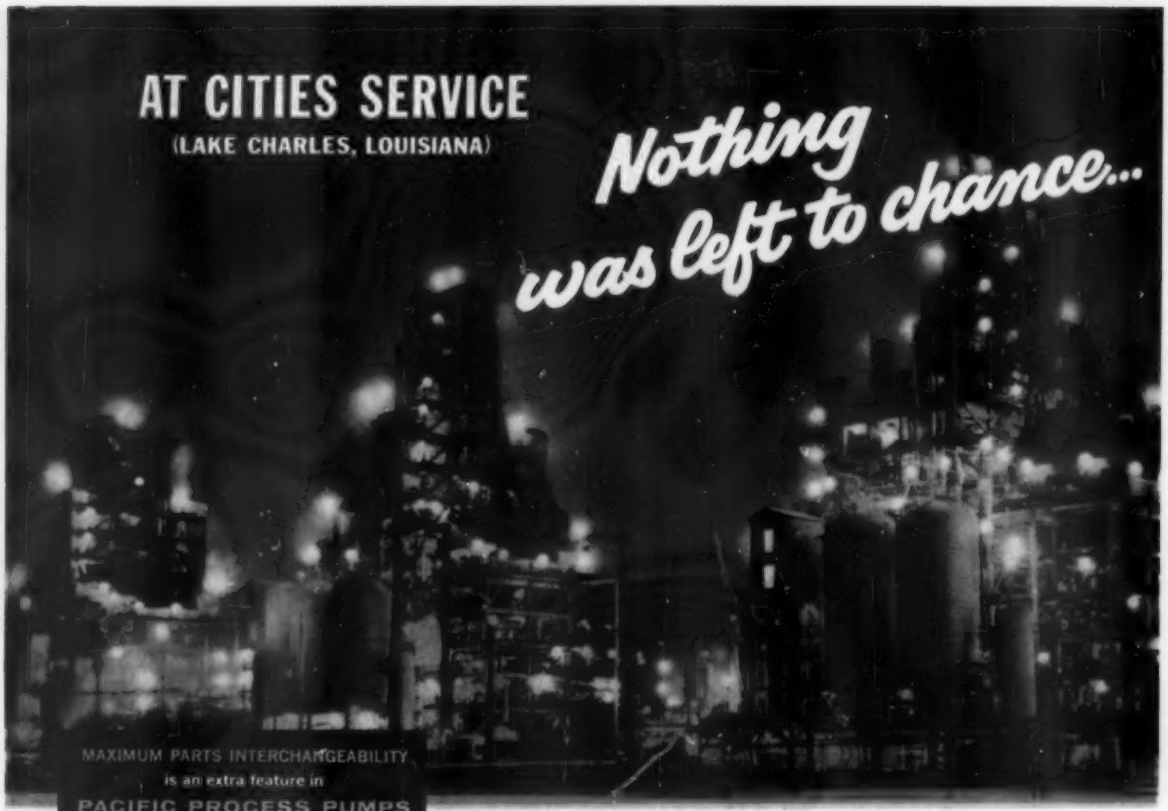

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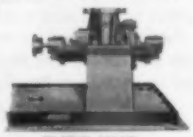
To 600 PSIG—To 650 DIFF. HD. FT.



TYPE HVC
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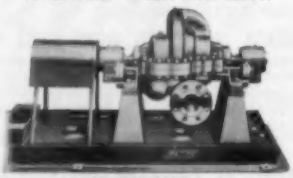
To 600 PSIG—To 1000 DIFF. HD. FT.



TYPE RHC
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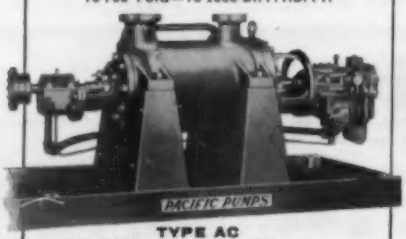
To 700 PSIG—To 1300 DIFF. HD. FT.



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CIT-CON, INC.	137
TOTAL	582

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Robert L. Wood, chairman of the executive committee of the Independent Petroleum Association of America, in a speech before a Desk and Derrick Club seminar at Midland, Tex.

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James H. Doolittle, vice president and director of Shell Oil Co., in a speech before a science - education seminar at Stanford University.

CALENDER OF EVENTS

SEPTEMBER

22-24 American Institute of Chemical Engineers, national meeting, Hotel Utah, Salt Lake City.

24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

24-25 National Association of Corrosion Engineers, San Joaquin Valley section, corrosion tour, Bakersfield, Calif.

25 Manufacturing Chemists' Association, Texas Chemical Council, chemical industry safety workshop, Shamrock Hilton Hotel, Houston.

25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

25-27 Illinois State Geological Survey, biennial petroleum engineering conference, University of Illinois, Urbana.

29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution

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the oilfield workers' show

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and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

5-9 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Mayflower Hotel, Washington.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

9-10 California Natural Gasoline Association, thirty-third annual fall meeting, Huntington - Sheraton Hotel, Pasadena, Calif.

10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.

12-18 OIL PROGRESS WEEK.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

15-17 Petroleum Conference on Well-Logging Interpretations, third annual conference, McMurry College, Abilene, Tex.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

16-19 Permian Basin Oil Show, Odessa.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-21 Instrument Society of America, national rubber and plastics instrumentation symposium, Akron, Ohio.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

20-24 National Safety Council, forty-sixth National Safety Congress, Conrad Hilton Hotel, Chicago.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

22-25 Southwestern Federation of Geological Societies, regional meeting, Mineral Wells, Tex.

23-24 Rocky Mountain Oil and Gas As-

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sociation, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

26-28 Gulf Coast Association of Geological Societies, Driscoll Hotel, Corpus Christi, Tex.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

31 Natural Gasoline Association of America, Southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

6-7 Louisiana Polytechnic Institute, School of Engineering, seventh annual instrumentation conference, Ruston, La.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

18-20 National Conference on Air Pollution, Sheraton-Park Hotel, Washington, D. C.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Kansas City.

2-4 Asphalt Institute, annual membership meeting, Shoreham Hotel, Washington.

7-10 American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.

9-13 National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.

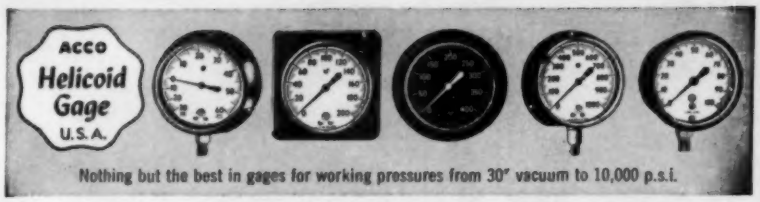
FEBRUARY

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.

9-11 American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.

15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.



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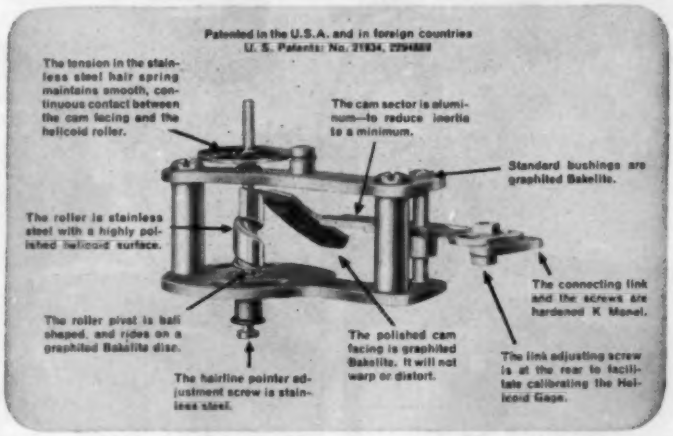
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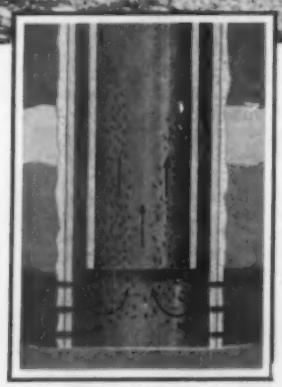

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JOURNALLY SPEAKING

Oil Hits the Third Grade

WE GET LOTS of articles submitted to us. These we look over with a hard professional eye to decide whether they are worth your valuable time. One such came in this week. We can't publish it, but we do think it is well worth these few minutes of your attention.

It was from a Miss Ruth K. Stroh, who teaches elementary school in Cockeysville, Md. She wrote about how she makes the oil business important to her students. And it left us with the sneaky feeling that we could learn something about oil by returning to her third-grade class for a refresher course.

Miss Stroh is one of those inspired teachers. "Our youth do need to consider oil in their studies," she says, and she has proceeded to do something about it on her own.

She knows her business, and her kids, too. First thing she does is to upset our time-honored, preconceived order in talking about the business. She starts at the back end (for us)—the corner filling station—and then takes them back to the producing wells, step by step. Now who else would have realized that this was the way to get these kids off on the right foot—by starting with something they know?

We'd have kicked them off on anticlines in West Texas, and they would have been throwing spitballs inside of 3 minutes.

Another thing. We shuddered slightly whenever she mentioned "black gold", which was often. But why should we? Isn't black gold a lot more interesting to third graders than petroleum and hydrocarbons?

Which gets us to the point. In the Big Yellow Book we try hard to put the week's news and technical progress into words that get across to you, our readers. We think this is a pretty smart audience, so we write in the vernacular. Trouble is, we get to thinking in the vernacular and forget that there's a much greater audience that needs to keep up with the oil business, too. In fact, just the third graders in this country outnumber all of us in this industry by quite a lot.

Maybe we talk to each other too much in this strongly fraternal business. Miss Stroh and thousands of teachers like her would no doubt welcome our thoughtfulness if we'd talk to their students once in a great while. They could help us learn how to do it, too.

Aid to education is something beside federal grants and local tax rates. It can be personal and greatly rewarding if we'll look right at home to see where we might lend a hand. All the multimillion-dollar national advertising the industry has underwritten couldn't match the impact of one oil man talking to some school kids in every town and city in the nation.

Tulsa is an oil town and for that reason may be more conscious of oil's responsibility to our schools. We're proud, for example, of a "30-hour" club we have here. Its members, from all walks of oil life, devote 30 hours a year to helping out on education in some Tulsa school. Recently they went beyond that. A lot of senior high school freshmen wanted to enroll in elementary physics. But no instructor could be found. From a number of offices and labs around Tulsa came volunteers to take on this temporary teaching assignment. This meant some sacrifice on the part of individuals, and companies, too. But where could time be better spent today?

Now we can't all launch into teaching high school physics. But we can and should lend a hand in some small way. If it means bending some young mind to thoughts of becoming a geophysicist or a petroleum chemist, fine. If it means no more than giving an incipient citizen a clear, true concept of this great business, that's fine too.

Power to you, Miss Stroh, for doing a good job, along with your local oil men. And more power to you for jabbing our conscience. To you, and all like you, the industry tips its hard hat.

George Weber

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A new approach to gas legislation is in order

DEEP pessimism prevails in the natural-gas industry over early prospects for any way out of the regulatory status quo—which has been jocularly defined as "Latin for the mess we is in."

The gas industry is really in a regulatory mess. Since the Phillips decision 4 years ago producers have had no means of ascertaining what prices they can get for their gas. And as long as the Memphis decision stands, pipelines face similar uncertainty as to what prices they can charge for resale of the gas.

At various stages of their journey toward the Supreme Court are a dozen other cases which promise further to confuse rather than clarify the situation.

THREE WAYS OUT are possible, though none is very hopeful. If the industry can survive in the meantime, the courts may eventually render some consistent and practical decision.

If the Supreme Court upholds the Memphis decision now on appeal the effect will be that the Federal Power Commission cannot change pipeline rates under its normal procedures and that contract prices prevail. But under the Phillips decision producer contracts are set aside and FPC fixes the price.

If the court grasps the inconsistency here it could correct it with language establishing a new line of interpretation for lower courts to follow. But this would be a slow process.

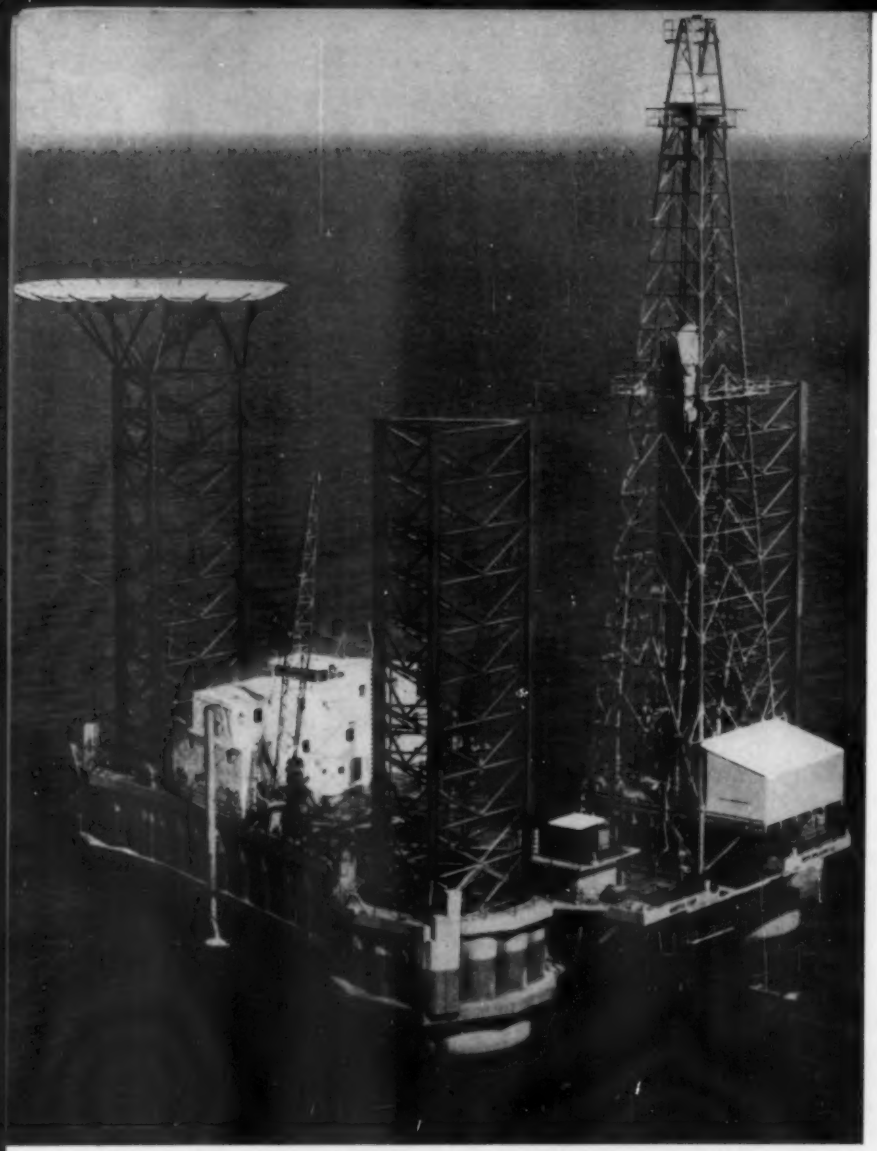
Another possible way out is through expedited FPC decisions and administrative procedure. FPC is now ready to work with industry in attempting this. Since everything it does will get court review anyway, an emboldened or frustrated commission could get the ball rolling faster by rearing back and making arbitrary decisions on the dozens of pending questions surrounding producers' prices.

But there are legal and practical difficulties in that route, and few practitioners expect that FPC will be able to make much progress out of the morass through its own efforts.

NEW LEGISLATION is the only remaining alternative. The fate of the Harris bills and their predecessors makes this avenue look pretty discouraging. But it is not hopeless.

Each passing month of delay and uncertainty and each perplexing new court interpretation piles up manifest evidence that the whole 1938 Gas Act is in need of a stem-to-stern revision to suit modern conditions.

This new approach to legislation is being explored, timorously, by several unofficial groups in various segments of the industry. This is most encouraging. From extensive public discussion there could evolve the framework of a different type of law regulating the gas business. For the long range, this is the best way out of the current dilemma.



R. S. (Mister Cap) Barnwell of Barnwell Offshore, Inc., called on an independent Pittsburgh Steel Co. distributor for completely integrated service when this new offshore drilling barge was built—shown here on location. That's how the independent distributor made a big contribution when . . .

Johnny Morgan, drilling engineer for an independent Pittsburgh Steel Co. distributor, left, confers with R. S. Barnwell Jr., president of Barnwell Offshore, Inc., on plans for the Mister Cap offshore drilling barge.

Mister Cap Sailed On Time

Mister Cap not only sailed on time but also set a record by requiring only 12 days from christening to bringing in an oil well.

And that included the time it took to move the rig some 40 miles out in the Gulf of Mexico in the Mississippi Delta area.

Back of that record was a story of an independent distributor's service and the quality of the Pittsburgh Steel Co. oil country goods he supplied.

Here is that story:

When Barnwell Offshore, Incorporated, of Shreveport, La., built the new $4 million "Mister Cap" drilling barge, Barnwell asked this independent distributor to supply everything above and below the barge deck connected with drilling operations.

That included not only drill pipe, casing and tubing but also the mast and draw works, the pumps, the Diesel-electric equipment, pressure vessels, the valves and fittings and even the pipe usually supplied by shipbuilders who fabricate barges.

• **Adequate facilities**—The independent distributor was able to do a "lock, stock and barrel" job because of the wide range of services and facilities he offers customers.

Equipped with a Fabricating Division, Machine Shop, Welding Shop, Threading Department, Compressor Department and a Service and Parts Department, this independent distributor is hard to beat for a completely integrated service.

Although not every independent distributor has this line-up of facilities, it is typical of the service independents offer oil country customers.

V. J. (Vic) Martzell, vice president of the independent which did the big job for Mister Cap, says:

"We stay in business because we can make quicker decisions and because we're willing to get more sand in our shoes.

"Around here it's routine to keep close track of our customers' drilling operations and to make sure drillers get pipe and equipment they need when they want it without loss of rig time."

When you're paying around $1,000 a day for operating a land rig and as much as $8,000 a day to operate an offshore rig, you appreciate a supplier who can get you the pipe and equipment you need within hours.

All the independent distributors handling Pittsburgh Steel products in the

oil country operate that way. That's the key to their success . . . service.

This service continues long after the order has been filled. On the Mister Cap, for example, representatives from the closest of the distributor's twelve stores can be in constant contact with the superintendent in order that his every need may be fulfilled in a minimum amount of time.

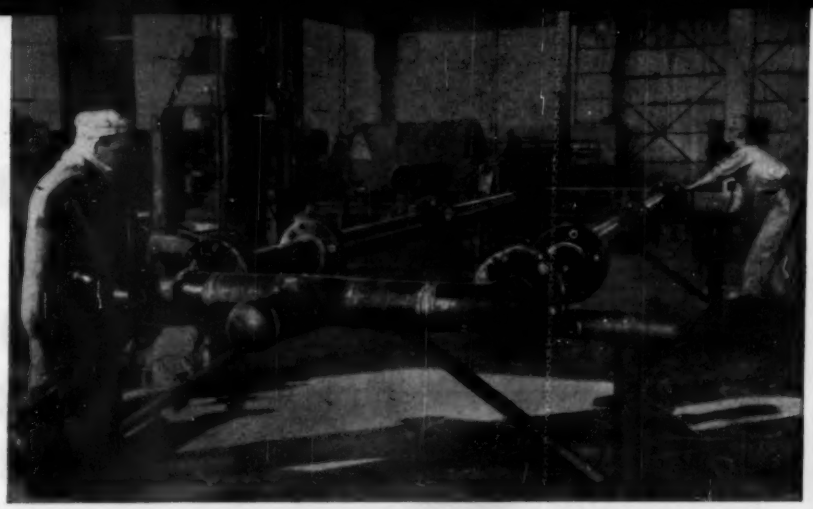
• **140 stores in field**—Wherever you are operating, you'll find the store of a Pittsburgh Steel independent distributor handy. There are more than 140 such stores scattered through the oil fields to supply top quality Pittsburgh Steel drill pipe, tubing and casing.

Independent distributors are ready for action—sales action. Their well-stocked stores make the best and latest equipment available 24 hours a day, seven days a week. Independents' service is flexible, free of unnecessary paper work and red tape delays.

Independents are fully competitive because their costs are low. A local businessman—familiar with local business people and local business problems—the independent distributor is in his community to stay. He knows his success is related directly to selling quality products and providing unmatched service. That's why the independent distributor selects Pittsburgh Steel's Seamless Oil Country goods. And it's why you can rely on all the independents listed here.

When you need a string of drill pipe, casing or tubing, call one of these independent distributors.

You'll do better with the pipe of your choice bought from the distributor of your choice.



A gas measuring station for a natural gas line is prepared for hydrostatic testing in the distributor's large, well equipped Fabricating Division.

Adequate field stocks of Pittsburgh Steel Company tubing enable this Louisiana distributor to serve his customers adequately and quickly.

Thomas C. Poindexter, vice president and manager of the distributor's Fabricating Division, checks on compressor unit built for a pipe line company.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

Cardwell Manufacturing Co.
Wichita, Kansas

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Chicago 5, Illinois

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

Murray Brooks, Incorporated
Lake Charles, Louisiana

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

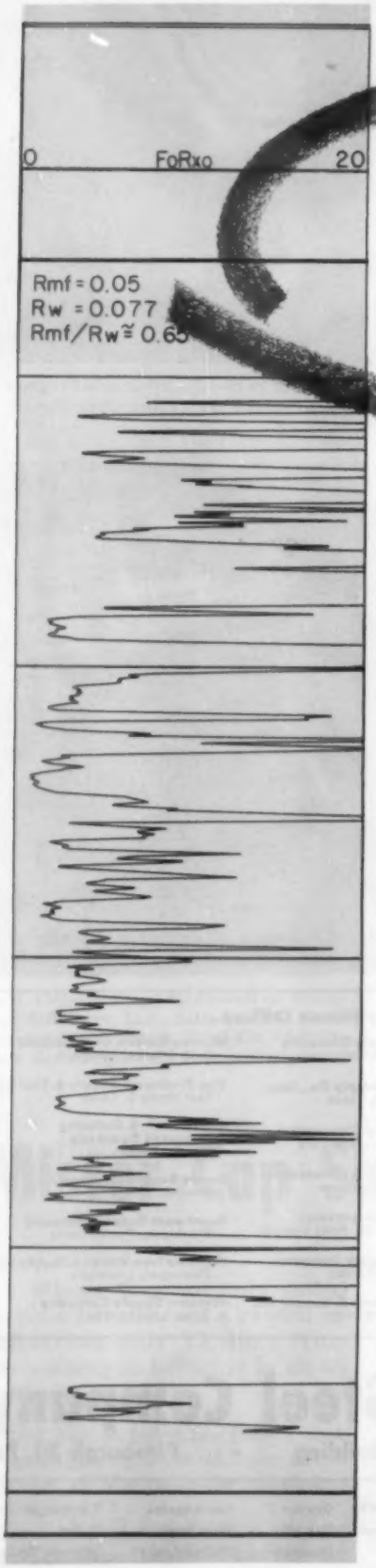
Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta, Chicago, Cleveland, Dallas, Dayton, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Tulsa, Warren, Ohio



FoRxo

(Focused Resistivity)

Porosity Determination is Simple with Welex FoRxo Log

There is no other logging device in the oil field today that can so accurately distinguish vertical changes in lithology as the Welex FoRxo. This logging device, as its name implies, measures directly the resistivity of the flushed mud filtrate invaded zone—Rxo. At the same time, it also records an SP curve and a Caliper curve.

By focusing current from a pad which is held against the side of the hole, the measurement of Rxo is accomplished. The conversion of Rxo to porosity is a simple step.

The Welex FoRxo Log, in conjunction with the Welex Guard Log (which is focused deep in the formation to read true resistivity—Rt) provides an unbeatable Production Guide for those difficult-to-analyze wells where formations and mud resistivities are similar. Thin beds, shaly sands, rapid lithological changes all are easier to analyze with this combination of Welex logs.

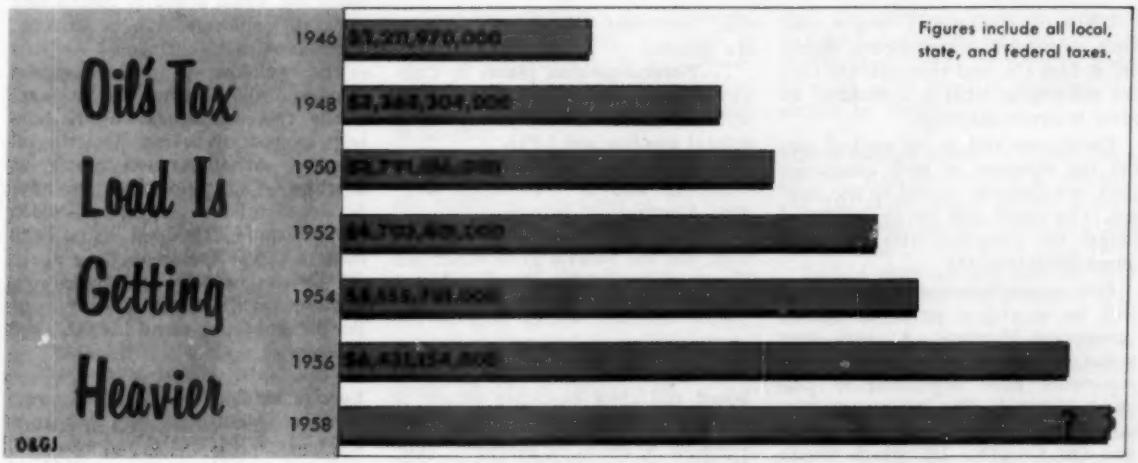
The Welex FoRxo Log is another Welex Production Guide that has earned the confidence of oil men everywhere.

Well Experienced

ORIGINATORS OF Welex JET PERFORATING

WELEX, INC.

General Offices: 1400 East Berry, Fort Worth, Texas
Division offices in Denver, Houston, La Habra, Midland, New Orleans, Tulsa and Wichita.
District offices in every major oil center. Subsidiaries in Canada, Peru and Venezuela.



Oil on Notice to Expect Higher Taxes

THE OIL INDUSTRY and the motoring public have a clear warning that the federal tax on gasoline may be increased by 1 or 2 cents a gallon next year.

Budget officials are pointing out that the highway trust fund which finances the interstate road program will start running a billion-dollar deficit in 1961.

Since the general fund also will be running $12.2 billion in the red by that time, the highway fund can count on little help from that source. Increased taxes are being advanced as the solution to carrying out the road program.

Statements of budget officials are regarded as a trial balloon at the moment in Washington. Administration sources apparently are preparing the public and Congress for the unhappy prospect of raising taxes at the next session.

What Congress will do is another matter. But a tax increase on gasoline can be regarded as a definite threat.

The tax burden . . . Marketers already are touchy about the high taxes on gasoline.

Present tax is 3 cents a gallon. State taxes range from a low of 3 cents a gallon in Missouri to a high of 7 cents in several states. The average is 5.94 cents a gallon, with the average levy on gasoline from all sources hitting 8.94 cents a gallon.

How Taxes Have Grown

	Cents		
	Price of gasoline*	Total tax	Total price
1920	29.74	0.09	29.83
1925	20.09	2.11	22.20
1930	16.16	3.79	19.95
1935	13.55	5.29	18.84
1940	12.75	5.66	18.41
1945	14.22	6.02	20.50
1950	20.08	6.68	26.76
1951	20.31	6.84	27.15
1952	20.24	7.32	27.56
1953	21.28	7.41	28.69
1954	21.56	7.48	29.04
1955	21.42	7.65	29.07
1956	21.57	8.36	29.93
1957	22.09	8.85	30.98
1958	21.37	8.94	30.31

*Average over nation for regular.
Source: APIC.

Marketers claim it's difficult for the motorist to realize that taxes represent nearly 30% of the price of gasoline. But that's true.

States in 1957 collected $2,911,763,000 in motor-fuel taxes. The federal Government took another $1,670,382,000 from the same sources.

The gasoline tax ranked second as the biggest source of funds for state governments. It represented 10.6% of all state taxes collected last year and averaged $17.19 per person. Only the general sales tax raised more revenue for the states.

The whole picture . . . The gasoline tax, however, doesn't tell the entire story.

Total tax bill of the petroleum industry reached a new high of $6,431,154,000 in 1956, latest year for which complete statistics are available.

Indications are this figure will be topped by a good margin in 1957 and 1958 since the 1956 figures reflect only part of the gasoline-tax increase made to launch the highway program.

Pattern for this tax bill has been an increase every year. In fact, it has tripled in the decade since 1946—from $2.2 billion to $6.4 billion.

Other noteworthy facts about the 1956 petroleum tax bill show it:

. . . Equals about 78% of the value of all crudes produced and imported into this country that year.

. . . Represents about 50% of the wholesale value of all finished petroleum products made during the year.

. . . Accounted for about 7% of all taxes collected by all levels of government, federal, state, and local.

Where the tax spiral will end, none professes to know. But it puts the oil man on an increasingly tough spot. He's pressured on all sides to keep prices low, but so far he's unable to do anything about taxes, the major factor in his price structure.

New Oil Major Born

. . . as independents Signal and Hancock merge into $500-million integrated firm with international holdings.

TWO of California's largest and most aggressive independents, Signal Oil & Gas Co. and Hancock Oil Co., are merging in what is considered an ideal business marriage.

Details are still to be worked out, but the directors of both companies have unanimously agreed to the merger. The result will be an integrated major oil company with assets of about $500,000,000.

One accomplishment of the merger will be to end a series of rumors concerning Hancock. At least four major oil companies at various times reportedly have negotiated to purchase Hancock. The last reported involved in Hancock talks was Standard Oil Co. (N. J.), which finally dropped the deal (OGJ, June 30, p. 45).

The new Signal Oil & Gas Co. which results will have:

. . . **A domestic oil production** of 65,000 bbl. daily. With a California output alone of about 53,000 bbl., it will rank fifth largest in the state.

. . . **Refineries** at Long Beach, where Hancock's fire-damaged plant will be enlarged and modernized, and in the San Francisco Bay area and the Pacific Northwest, where new ventures are planned.

. . . **Natural-gasoline plants** in California, North Dakota, and Oklahoma, with a 12,500-bbl. daily output of natural gasoline and LPG.

. . . **Marketing facilities** throughout California and in Washington, Oregon, Arizona and Nevada.

. . . **Foreign interests** in Venezuela, Iran, and the Neutral Zone which net Signal some 35,000 bbl. daily of crude.

New officers . . . S. B. Mosher, founder of Signal, will be chairman of the board and chief executive officer of the new company. R. H. Green will continue to serve as president. John W. Hancock, president of Hancock, will be a vice president.

Insofar as the California operations are concerned, the merger is being appraised as a good deal for both companies by Los Angeles oil circles. Signal, with a current California production of about 38,000 bbl., has no refineries. Hancock does not have enough California production to supply its 21,000-bbl. Long Beach refinery.

Signal sold all of its southern California service stations to Standard Oil Co. of California in 1947. Since then Socal has been processing Signal's crude and supplying it with gasoline and products. These are distributed by Western Hyway Oil Co. and sold under the Regal brand in central and northern California, and in Arizona, Nevada, and Oregon.

The well-known trade name of Hancock will continue to be used.

The two companies already hold joint interests in several domestic oil ventures. At Huntington Beach, as Southwest Exploration Co., they have developed offshore state leases which produce some 20,000 bbl. daily. Each owns a 28.5% interest in Long Beach Oil Development Co., which as contract operator for the City of Long Beach, produces about 23,000 bbl. daily.

Foreign holdings . . . In the international oil world, the two companies are partners in several ventures.

Signal and Hancock own 50% of a 43-sq. mile concession at Lake Maracaibo, Venezuela.

Six wells on the concession have been completed and tested for a combined production of about 40,000 bbl. daily. Two rigs currently are drilling on this concession, which Signal claims could be one of the most important ever developed by an independent oil company.

The two companies also own identical interests in Iran and in the Neu-

Signal Began on $4,000 Loan and a Booklet

SAMUEL B. MOSHER
. . . Got tired of life on a fruit farm.

IF THE Signal-Hancock merger goes through, Samuel B. Mosher, chairman of the board of Signal, will have run an original investment of $4,000 into a property with an estimated value of around $500 million.

The Mosher-Signal story actually had its start on a 17-acre citrus ranch near Whittier in Southern California. It wasn't that Mosher found oil on the ranch. Quite the contrary. It was the long hours of labor and no profits to split with the ranch's owner that convinced him to look elsewhere in seeking his fortune.

On a rare day off from his farm chores, Mosher and a friend happened to be driving through a Los Angeles oil field when they were attracted to a small casinghead-gas plant.

They investigated and found it was a one-man per shift operation which turned out a product valued then at $.23 a gallon that was in steady demand by refineries. A perfect combination for breaking away from the farm, they concluded.

With $4,000 borrowed from skeptical parents and a Bureau of Mines do-it-yourself booklet on casinghead-gasoline plant operations, Signal Oil & Gas Co. was born in 1922 in the Signal Hill oil field at Long Beach.

There was just one slight flaw at that point.

Signal had its plant all right. But Mosher wasn't able to get any of the independents to let Signal process their gas. It seems two farm boys with a free government pamphlet didn't exactly inspire confidence among the oil men.

Finally, in desperation, Mosher went to Shell Oil Co. and asked them to let Signal process the gas

tral Zone. In the former their joint interests amount to about 10,000 bbl. of oil daily. In the Neutral Zone each owns a 15% interest in the American Independent Oil Co. Total net oil production of the new company from these Middle East holdings will be about 25,000 bbl. daily.

Refinery plans . . . Hancock has been a refiner for many years, as well as the operator of a large sulfur-recovery plant in the Wilmington area.

Its 21,000-bbl. refinery, modernized in 1956 by the addition of new catcracking facilities, was badly damaged by fire last May.

Plans are now under way to enlarge the Long Beach plant and to install additional process facilities. To supply the northern California and Pacific Northwest market now served by Signal's marketing subsidiary, plans are being made for a new refinery in the San Francisco Bay area and another in the Northwest.

In addition to Mosher, Green, and J. W. Hancock, officers of the new Signal Oil & Gas Co., will include: Vice presidents, H. F. Clary, B. H. Dresser, C. R. Gaylord, W. T. Hancock, R. W. Heath, O. W. March, J. H. Marshall, N. D. Taylor, W. E. Walkup, and G. L. Young. E. P. Ludman will be treasurer; A. E. Stebbings, secretary; and G. F. Krause, controller.

Present members of the boards of both companies are to be named to the board of the merged company.

on Gas Plants

then blowing to the air from Alamitos No. 1, the Signal discovery well, until Shell could complete its own plant.

Shell sent their gas man out to look at Signal's setup. His comment was:

"I think you could knock more gasoline out of the gas with a stick than you ever will get with your equipment."

But, in the usual success-story fashion, Signal did get the Shell gas, did process it and at a profit, and grew rapidly. Eventually, Signal had seven such plants in operation at Signal Hill and elsewhere in the Los Angeles Basin.

The rest of the Mosher-Signal story is an unbroken string of successes. If the Hancock merger is consumated, Signal will be the fifth largest producer in California, ranking ahead of such major companies as Texaco and Tidewater.

Cost Data Dangerous

. . . when used by natural-gas producers to prove they need higher prices, panelists tell natural gas association.

GAS PRODUCERS should use extreme caution in using cost data to justify prices before the Federal Power Commission. The data, favorable in one case, might be used against them in another.

This was the warning sounded last week during a panel discussion before the producers committee of the Independent Natural Gas Association of America, meeting at New Orleans.

Panelists said that the cost of discovering and producing gas should not be used as the basis for setting gas prices even though such information is required by FPC and the courts under the city of Detroit case.

New sales . . . William J. Merrill, attorney for Humble Oil & Refining Co., said cost data should be kept particularly out of applications for certificates to begin new sales—unless the Supreme Court rules otherwise in pending appeals of the CATC offshore and Oklahoma Natural Gas Co. cases.

In these and other cases consumer interests have asked the FPC to set maximum prices.

Merrill explained that, at present, the burden of proof is on the opponent to show that a price is unreasonable. And the opposition cannot make out much of a case if the producer has submitted no cost evidence.

The producer can simply rest his case by submitting his contract as evidence that the project is economically feasible and that a market exists for his gas at the proposed price.

Merrill suggested that when the FPC asks producers to submit cost evidence in support of a certificate for a new sale, they would be wise to refuse. Otherwise, the case may develop into a full-blown rate investigation and thus undermine the producers' contention that cost has no place in deciding on a new certificate.

The panelists agreed that cost data must be submitted to justify a price increase for an independent producer, but Merrill advised that even this should be done with caution.

The FPC recently has allowed some price increases to take effect without any filing of cost evidence in cases where the increases are small and do not greatly exceed prevailing field prices.

In other cases increases have been approved after filing only generalized evidence.

In major rate increase cases, however, the producer must be prepared to submit and defend detailed evidence that his costs justify the price increase, although other types of evidence also should be shown.

Where trouble brews . . . The worst possible trap into which a producer can fall is to try to justify a price increase based on high costs in a particular field.

Such a showing may win the case for the producer, the panelists said, but the same formula will be used against him when he applies for an increase from a field with somewhat lower costs.

The consensus of the producers and their attorneys at the meeting was this: If prices are to be based on a cost formula, the only way for producers to get fair treatment is to convince the FPC that company-wide costs, rather than local or area costs, should be used.

As Merrill expressed it: "The gas-producing business simply does not operate on a venture-by-venture basis. The successful producer must operate on an over-all or company-wide basis and average his successes and failures in such a manner that he comes out with a reasonable rate of return on his investment.

"In particular, exploration costs are generally incurred for the company as a whole and cannot be related to particular properties or areas.

"In addition, the practice of accompanying applications for rate increases with cost exhibits could well be used by intervenors and the FPC staff as a precedent by which to attempt to bind the producer in a subsequent rate hearing."

The panelists had another bit of advice for the producer concerning prices.

They contended that a price-increase contract should provide for periodic fixed increases or renegotiated prices, rather than favored-nation or spiral-escalation clauses.

In addition to Merrill, those participating in the panel discussion were Henry R. Domers, executive director of the FPC, William J. Grove, formerly assistant general counsel of FPC and now attorney for independent producers, and Charles G. Daley, formerly with the FPC rate division and now rate consultant to producers. Moderator was James D. Parriott, attorney for Ohio Oil Co.

LACT: A Youngster Now, Soon a Giant

• Just 3 years old, automatic custody transfer has growing pains. But a Journal survey shows producers are saving money. And pipelines are, too. P.d. meters are favored over other types, but there are legal problems.

"WITHIN 10 YEARS we will probably be running 80% of all our crude through LACT systems."

This startling statement comes from the production department of Phillips Petroleum Co.

It points dramatically to the sudden spurt in the last 12 months in the use of automatic transfer systems for delivering crude to pipelines.

The Phillips view is typical of many collected in an Oil and Gas Journal Survey. Together they mean that the switch to automatic transfer will intensify in the months ahead.

This move to LACT is remarkable when you consider that the first unattended system in the U. S. was placed in operation less than 3 years ago at Bloomer, Kans., by Gulf Oil Corp.

Shell Oil Co., however, did experimental work as early as 1948 in Antelope field in North Texas.

A survey made early this year by the LACT subcommittee of the API committee on crude-oil measurement found roughly 100 systems in or near operation over the country. The Journal survey shows this number probably will be doubled by the end of the year.

1. Where It's Used

Here's what is causing the spurt: Availability of more reliable equipment; field tests proving to both producer and pipeline that LACT measurement is efficient and accurate; recognition of this by state regulatory bodies; savings in crude, labor, and steel; and a pressing need by producers to cut operating costs.

Despite the pickup in LACT unit installation, producers are picking their spots carefully.

The reason simply is that cost can outweigh savings gained, or the payout will take too long in many fields at present.

Producers who are installing LACT find it financially attractive where:

. . . **Large new production** is being developed.

. . . **Operations** are unitized.

. . . **Handling facilities** are worn out.

New production is adaptable to LACT because the operator starts from scratch in acquiring gathering and storage facilities. And the larger the volume of crude handled, the more LACT saves.

New producing areas provide the largest percentage of total oil delivered to pipelines automatically. The Four Corners area, for instance, runs far ahead of older producing areas. At least 80% of the oil delivered to the two major crude lines in Four Corners is by LACT systems, according to one estimate.

LACT also is especially attractive where unitized operations are starting and for older unitized areas as well.

Sun Oil Co. has LACT in the segment of the huge SACROC unit it operates, and The Texas Co. has two systems in the large Cogdell Canyon unit. LACT can bring the most savings where facilities are consolidated and concentrated.

Where the operator is confronted with worn-out tanks, treaters, lead lines, and other facilities on a lease, he can often make LACT pay off even when production is relatively small.

There are other circumstances under which LACT is being used successfully. Secondary-recovery projects, whether unitized or not, adapt to LACT well because they nearly always involve some concentration of crude-handling facilities.

Systems also have been installed on production in remote, rugged areas where conventional handling operations are unusually costly.

2. The Savings

There is no iron-clad way to figure how much LACT will save. Each lease must be investigated on its own.

Some experts believe that somewhere between 100 and 200 bbl. daily is the minimum oil volume at which a producer can save enough in steel, labor, and hydrocarbons to make an LACT system pay out.

The biggest saving is in steel, some contend. In Seeligson field in South Texas, where Sun Oil Co. is operator, oil initially was funneled from field wells to 184 clusters of tanks. When LACT is fully installed, oil will move to only 15 central locations and eventually, perhaps, to fewer than this.

Another saving results from cutting vapor loss due to "weathering." The saving comes not only in volume but in gravity.

Shell says it saves 0.2 of a degree of gravity, or 0.5% of total production by preventing weathering in its small Antelope field operation. If this percentage were applied to Texas' total production, it would amount to 5 million barrels per year.

Labor savings are smaller than those in steel and oil for the producer, but they add up.

For the pipeliner there is a labor saving, too. He can release gaging personnel because LACT does not require tank gaging, putting tanks on and off line, checking b.s. and w. content of oil, and checking oil gravity.

Some producers are disgruntled because they feel the pipeline companies are getting a free ride on LACT.

One large producer told the Journal somewhat bitterly that the pipeline profits more than the producer. But it's the producer so far who bears the full installation and operating costs.

A few pipeliners concede that the producer has a point and that some form of cost sharing may come about.

3. Some Problems

Producers universally are excited about LACT. All those interviewed by the Journal predict a mushrooming use of the technique.

Some are moving more slowly than others, however, because low production has forced them to conserve their capital. Others are awaiting refinements in equipment.

One major is delaying a full-scale plunge into LACT because on one of its first installations it had to recalibrate vessels purchased from its suppliers. It believes that LACT equipment in the next year or two will be more reliable and cheaper.

Another firm felt it unwise to "replace one pumper with two engineers to keep a unit functioning properly." Others found no fault with present equipment but still expect future systems to be better.

(Continued on page 56)

LACT Systems in Texas: How Big, Where They Are

Company	Lease; Field; and County	Type of LACT	June production* (Barrels)
Phillips	Ranch "C"; Panhandle; Hutchinson	Dump Tank	3,603
Shell	Hugh Henderson; Antelope; Clay	Weir Tank	6,415
Humble	All leases; Anahuac; Chambers	P.D. Meters	222,539
Shell	W. M. Moore, W. M. Moore "A," A. L. Wasson "D," and Dora Roberts leases; Wasson 5,100; Gaines and Yoakum	Weir Tanks	64,560
Shell	Wasson "A," "B," "C," and "E," Brand "A" and "B," Corden, Langdon "A," Dowden, Johnson, Hensley, Comer, and Bennett "A" leases; Wasson; Gaines and Yoakum		
Pan American	Fannie Drake; Hastings; Brazoria	Dump Tank	19,492
Pan American	C. S. Dean "A"; Slaughter and Levelland; Cochran and Hockley	Dump Tank	22,061
Phillips	F. P. McCabe; Emperor; Winkler	Dump Tank	16,766
Cities Service	Cunningham and Hughey "A" and "B" leases; Panhandle; Clay	P.D. Meters	16,525
Kewanee	Cree-Sykes Unit; Cree Sykes Upper Gardner; Runnels	P.D. Meters	50,724
Texaco	Boney NCT-1; Panhandle field; Carson	Dump Tank	4,733
Texaco	Cogdell Canyon Reef Unit; Cogdell Canyon Reef; Kent and Scurry (two systems)	Dump Tank	290,312
Texaco	Pierce Estates; North Withers; Wharton	Dump Tank	29,145
Texaco	Sandusky Oil Creek Sand Unit; Sandusky Oil Creek; Grayson	Dump Tank	26,736
Sun	M. Guerra & Sons "A"; Guerra; Starr	Dump Tank	7,748
Sun	State Tract Leases 288 and 307; S.W. Redfish Reef; Chambers	P.D. Meters	38,511
Sun	SACROC Unit (Sun-operated segment); Kelly-Snyder; Scurry	Dump Tank	55,500
Shell	N. Jobe; East Texas; Gregg	Weir Tank	3,364
Shell	Allen Tooke; East Texas; Gregg	Weir Tank	4,389
Shell	B. F. Laird; East Texas; Gregg	P.D. Meters	9,104
Shell	Joy Waterflood Unit; Joy Strawn; Clay	P.D. Meters	24,668
Shell	T. D. Green, A. Finston, Q. Little, L. A. Steedman, and J. Embry leases; Big Mineral Creek; Grayson	Weir Tank	54,306
Humble	Jefferson Land Co. A/C No. 1; Lovells Lake; Jefferson	Dump Tank	6,819
Humble	Galveston Bay State "A"; Red Fish Reef; Chambers	Dump Tank	25,534
Humble	King Ranch-Stratton; Stratton; Nueces, Kleberg, and Jim Wells	Dump Tank	57,293
Humble	Kiesling & Dixon Account No. 1, Scott-Beamer, and Herman Hospital Estate leases; Webster; Harris	Dump Tank	157,587
Humble	Sarita Field Unit; Sarita field; Kenedy	P.D. Meters	11,944
Gulf	S. B. Burnett lease; Panhandle; Carson	P.D. Meters	18,470
Gulf	W. E. Estes, Hutchings Stock Association, G. W. Obrien et al. leases; North Ward Estes; Ward and Winkler	P.D. Meters	805,569
Phillips	Cummins "A"; Goldsmith 5,600 and Goldsmith Clearfork; Ector	Dump Tank	4,100
Phillips	University Andrews; Embar Ellenburger; Andrews	Dump Tank	43,529
Mills Bennett	Mills Bennett Estate lease; Mills Bennett Estate field; Brooks	P.D. Meters	24,199
Ambassador	Strawn (Basal) Sand Reservoir Unit; Demoss Strawn; Archer	Dump Tank	28,000
TOTAL			2,154,245

*From lease on which LACT is installed.

Shell Applies for More LACT

SHELL Oil Co. last week went before the Texas Railroad Commission with the largest Texas LACT application yet.

Shell seeks permits for P.d. meter-type systems on its leases for four West Texas fields. The systems would transfer to pipelines automatically production from Shell's Sealy Smith lease in Monahans field of Ward and Winkler counties, the H. L. Lowe lease in Wasson field of Yoakum County, University 9-AA lease in Block 9, Ellenburger field, and its University "D" and "F" leases in South Andrews Devonian and Wolfcamp fields in Andrews County.

The Monahans system actually will consist of four separate LACT units and four collection batteries—one to handle oil from the Permian-Tubb 1, 2, and 3 zones; one for the Clearfork; another for the Fusselman-Devonian pays; and a fourth for the Ellenburger.

The Shell systems will be similar to those installed by Cities Service Oil Co. on its Hughey leases in Panhandle field, by Gulf Oil Corp. on its North Word Estes leases, and by Shell itself on its B. F. Laird "A" lease in East Texas field.

The company told the commission it had tested the Clearfork metering system for 4 months. In a 65,000-bbl. run, the meter volume differed from the hand-gaged volume by only 2.589 bbl. or .004%.

Unusual features of the Monahans system include:

... A present meter which permits running whatever volume might be desired in a daily shipment. When this volume is reached, a set-stop valve shuts down delivery.

... A second present meter which shuts in the system when the monthly allowable has been run.

The Permian-Tubb, Fusselman-Devonian, and Ellenburger systems in Monahans, Shell said, will go into operation in the near future. Plans are to begin operation of the Block 9 and South Andrews systems by October 1 and the Wesson unit by the middle of November.

Shell asked for permanent rather than temporary permits on grounds that there should be no need for further testing this type equipment.

(Continued from page 54)

A few operators have held off because their pipeline affiliates are dragging their feet. One chief engineer said, however, he expects soon to "punch a finger through the dike and then wash the dike down."

Another gripe of the producer toward the pipeliner is that some pipelines insist on lengthy weathering time. One requires 24 hours. This forces the producer to install a system to gather vapors, which hikes the cost, or to suffer a loss of hydrocarbons.

Most lines taking oil via LACT are more lenient, and one producer said his pipeline requires only 3 minutes of weathering.

A line spokesman explained that the pipelines want weathering to provide a stable fluid. Otherwise, the pipeline would have to maintain pressure storage all the way to the refinery.

Pipeline attitude . . . Pipelines generally favor LACT.

Like the producer, they are caught in a financial squeeze between rising costs and relatively constant gathering charges. And prospects aren't bright for raising charges to producers.

The Journal found only one case where a line refused to accept oil from an LACT system of a type already well proved in the field.

However, standards of the pipelines vary widely as to conditions under which they will accept oil via LACT. The discrepancy in weathering requirements shows that. But standards are almost certain to become more uniform as LACT experience piles up.

Some pipeliners claim that savings to them so far are meager because LACT systems are so widely scattered. One contends, however, that the pipelines have a real stake in LACT and should go out of their way to encourage its use.

In fact, some are doing just that by offering to assume the cost of periodically proving the meters in LACT systems.

4. The Equipment

LACT systems fall generally into three types. And, with the technique so new, producers are using many varieties of each type.

Though few systems are exactly alike, they can be broken down into:

... Positive displacement meters.

... Weir-tank types, in which crude flow into comparatively large tanks, usually 100 bbl. or more, is stopped and started by a weir control device.

... Dump-tank types or positive-volume measuring tanks. These employ much smaller measuring tanks as a rule, some as small as 1 bbl.

All types have automatic equipment to monitor oil quality, correct measurements for temperature, measure gravity, shut off oil flow when equipment fails or the allowable is run, and perform other functions.

P.d. meter preferred . . . Other things being equal, an overwhelming majority of operators queried by the Journal prefer the p.d. meter.

And it's a cinch, they say, that p.d. meters will dominate the LACT field in the future unless something better comes along.

P.d. meters are preferred because initial cost is less, maintenance is cheaper, and they are simpler and just as accurate as other types.

Also they're versatile. They can operate almost anywhere, particularly since pneumatically operated models recently have become available to supplement those operated electrically.

5. Boom in Texas—But

The first LACT units in Texas were approved by the Texas Railroad Commission for Shell and Phillips exactly 2 years ago on a trial basis.

Six months later the commission reviewed the operations and granted permanent permits. Other LACT projects came slowly at first, but the idea is now catching on rapidly. The commission has approved 34 systems, 21 of them this year.

Of the total, 18 are the dump-tank type, 10 are p.d. meter, and 6 are weir tank. They are scattered in all areas of Texas and handled about 2,150,000 bbl. of oil in June, the latest month for which figures are available. This is 3.26% of Texas total June production of 65,917,100 bbl.

Production in September is running a third higher than it was in June, and this means the volume handled on LACT leases is now around 3,000,000 bbl. monthly.

While the percentage is small, the fact that it was reached so quickly indicates what's yet to come.

Who's in it . . . Four majors currently dominate in Texas with 23 of the 34 LACT systems. Shell has eight, Humble six, Texaco five, and Phillips four.

Others operating—or soon to operate—include Gulf, Pan American Petroleum, Sun, Cities Service, Kewanee,

Mills Bennett Estate, and Ambassador Oil Corp.

The fact that some smaller independents are in the group is significant. Apparently it means they are convinced that LACT is not just a toy for the majors but an economical operation for all.

The largest concentration of Texas LACT production is in North Ward Estes field, where Gulf is tendering more than 1,000,000 bbl. a month with p.d. meters. The state's smallest system handles about 3,000 bbl. monthly for Shell on its N. Jobe lease in East Texas field.

Legal issues . . . In areas such as Texas where P.d. meters fail to predominate, the reason usually can be traced to governmental regulations.

In Texas, tax statutes say specifically that oil must be measured in a tank on the lease. Because of this, several companies have been advised by their attorneys to avoid P.d. meter systems in favor of the dump-tank type.

Efforts to get the statutes amended to keep pace with technological advancement in custody transfer have failed in the Texas legislature because the Railroad Commission wouldn't support the proposed changes.

Some of the companies using p.d. meters in Texas are running a bit scared. Humble, for instance, is using the meters on its leases in Anahuac field but also is gaging the oil manually and reporting the gages for tax purposes.

Others, however, use the meter measurements for tax reports. These include Shell, Kewanee, Gulf, and Cities Service.

The Railroad Commission apparently has set a policy of approving p.d. meter systems with no manual check gaging.

The Texas comptroller is the official charged with enforcing the tax laws in Texas, and the feeling is that he will not enforce manual gaging unless he encounters sloppy LACT measurement. This isn't likely.

It is no secret, however, that the companies which are going ahead in apparent violation of the statutes are troubled. They would like to see the legal situation clarified.

Other states also have failed to change their laws to keep up with advances in oil measurement technology. And there is some question of the U. S. Government's attitude on federal oil lands.

One thing is certain, however. The tide to automatic custody transfer of crude is coming in. Legal barriers may delay or detour it, but they won't stop it.

watching WASHINGTON

Bertram F. Linz

• Approval from our American neighbors

THE NEW import control program will ease the tension in Canada and Venezuela created by efforts to limit the U. S. market for foreign oil.

Government officials do not look for any shift in the present import pattern as a result of the increase from 713,000 to 751,300 bbl. daily in allowable crude imports next year.

That means that the two Western Hemisphere countries will share in the increase, allaying fears that Middle East oil would supplant their oil.

The new plan was discussed with Canadian and Venezuelan officials before it was made public. The promise in the plan that refiners dependent on Canadian oil would not have their supply curtailed was a strong talking point in getting Canadian acceptance.

Equally important, the program gives definite proof that foreign oil will be given a fair share of our market as it expands, as the Washington Government promised when controls were adopted.

Canada and Venezuela will file protests against the program. But the protests will be primarily for the record and are not expected to be pursued.

• Alaskan gas development looks good

THE WAY is open for large-scale development of Alaska's natural-gas resources.

The Interior Department has awarded leases to the highest bidders on 26 mile-square tracts in the Gubik field, where the first major find of gas in Alaska was made by the Navy some years ago.

Department officials are confident the activity generated in Gubik will spread to adjoining areas, where 4 million acres are available for noncompetitive leases.

Development of the gas field is expected to bring early building of a pipeline to Fairbanks. Alaska Propane Co., Inc., which has the franchise for LPG in the Fairbanks area, has plans for such a line. Alaska Propane was the successful bidder for 16 of the 26 tracts.

Once the industry gets both feet wet in the Alaskan muskeg, Interior officials plan to release additional areas for leasing. They are confident Alaska will provide the "big find" of the last half of this century, as East Texas did in the first half.

• Oil issues raised in congressional races

IF ANYONE in the industry thinks the recess between Congresses is going to take the heat off of oil, he's wrong.

On the contrary, oil is becoming a big issue in some of the preelection campaigns now under way.

The two issues pressed by antioil candidates are depletion and "favoritism" toward the international companies.

The recent Senate vote on cutting the depletion allowance has provided ammunition for candidates running against senators who voted against it.

The foreign issue has been raised by Rep. James Roosevelt of California. He used the recent appointment of Ralph S. Fowler as assistant director of Interior's oil and gas office as the springboard for an attack on companies operating in the Middle East.

Roosevelt paid tribute to Fowler's integrity and public spirit, but pointed out that Fowler had been connected with Aramco Overseas Co. for 8 years. Roosevelt intimated doubt Fowler could be impartial.

"I shall continue to observe and study all facets of the problem," Roosevelt said.

Import Plan Draws Fire

. . . from Texaco, Gulf. Foley says importers should process crude themselves. Mandatory control may come.

OPPOSITION to the proposed new imports-control program is picking up steam after a slow start.

Two of the nation's major oil firms, The Texas Co. and Gulf Oil Corp., have delivered blistering attacks on the plan to spread imports among refiners according to their refinery runs (OGJ, Sept. 15, p. 104).

Gulf threatened to withdraw from the voluntary program unless quotas are amended. Texaco demanded a rule requiring importers to process the imported oil in their own refineries.

The separate attacks came as most other refiners still were studying the new plan and withheld comment. However, two beliefs appeared to be gaining ground:

. . . **Mandatory controls** are nearly certain to follow if Carson's proposal is rejected or fails.

. . . **Small inland refiners** stand to gain very little under the new quota system.

Texaco's stand . . . Texaco President J. W. Foley called Carson to clarify and modify his proposals.

Foley declared the plan would be unfair unless it was amended to require an importer to process the crude in his own plant.

"Certainly the Government would not advocate a plan which would permit companies with no need or justification for imports, other than refinery runs, to enjoy a special unearned profit by allowing these companies to dispose of imports other than through their own plants," Foley said.

Foley said the Carson formula ignored the substantial investments and great risks taken abroad by American companies to develop the oil reserves needed to support the nation.

He declared "to permit companies which have no foreign investments or historical patterns of imports to receive allocations based strictly on domestic refinery runs is grossly unfair."

Gulf speaks up . . . Gulf, hardest hit of the major importers, made its unhappiness over Carson's plan crystal clear.

The Gulf announcement stated that "unless substantial modification is made in the plan, it will be forced to revaluate its earlier decision to comply with the voluntary program."

Much of Gulf's objections centered on its contention that the new plan "arbitrarily provides for quotas to all refiners, some of whom have neither the intention nor facilities suitable to refine imported crudes."

Such a method of allocation, the company contended, "amounts to a subsidy to these refiners." The company objected also "that the method represents a confiscation of property rights of those who have made the necessary huge investments over a period of many years, both here and abroad."

Gulf pointed out that it has been an importer since before 1920 and that many other refiners have been importing for years. It argued that these long-time importers have risked vast sums in developing foreign production, in building tankers, and in the construction of special refining facilities in the United States to process foreign crude.

The mandatory outlook . . . Government men concerned with drafting the new plan admit that it readily can be changed from a voluntary to a mandatory system if necessary.

But they also point out that any thought of mandatory controls will have to be based on experience in actual operation of the new system.

But by the time experience data can be gathered on any new plan Congress will be in session again, and the lawmakers are certain to be in the middle of any fight which develops.

The Carson plan has led to opposition even in government circles. The Small Business Administration is asking more for small refiners.

SBA officials believe that the 6% of capacity which these refiners will be able to import during the first half of 1959 is too little. They are making a canvass of the small-business segment to get refiners' opinions.

The Bureau of Mines last week issued a special report on refinery capacity as of last January 1. It showed a total of 325 plants, with a crude capacity of 9,409,700 bbl. daily.

The report showed that most refiners with substantial capacity already have been given quotas. Some 69 refiners in Districts 1-4 who have requests for quotas pending, if included in the program, would split about 50,000 bbl. daily among them.

But a substantial part of the 50,000 bbl. would go to one or two refiners who have a fairly large capacity. Others would get small quotas, running as low as 60 bbl. per day.

There is also a group of about 70 refiners who never have applied for quotas. Their capacity is estimated at around 380,000 bbl. daily. On the 6% basis at which the 1959 program will start, they would get about 22,800 bbl. daily. Some in the group might get as little as 10 bbl. a day.

Refiners with such small quotas probably would have difficulty in disposing of imported oil if they cannot use it themselves. Officials contend that under these circumstances extension of quotas to all refiners will be no windfall, as has been charged.

Stalled Pay Drive Overhauled

OCAW delegates representing rank-and-file union members over the country are in Long Beach, Calif., this week trying to breathe new life into their nearly dead wage-increase drive.

The convention later in the week is due a report from the union's 52-member bargaining policy committee on future plans. This same committee set up an ambitious bargaining program in a Denver session last February (OGJ, Mar. 3, p. 63), but union negotiators since have failed to sell it to management in the oil industry.

The policy committee has the authority to change the goals or call on union members for renewed efforts to win wage increases and other benefits in new contracts.

Only indication of what may come was a statement earlier by OCAW President O. A. Knight that he feels any new strategy should include plans for stepping up pressure on employers.

Housekeeping . . . Actually, this convention normally is considered more of a "housekeeping" meeting than anything else.

The total lack of success with the 1958 wage program, however, has forced an important decision on union membership and gives the convention greater importance than normal.

In the realm of "housekeeping matters," OCAW delegates will be asked to consider three major constitutional changes:

. . . **An increase in the per capita tax** paid by locals to the international

from $1.50 to $2.50. This same proposal would increase the dues range at the local level from the present $3-$6 range to a $5-$8 range. Locals have the option to set the exact amount within the designated range.

... **Hold a union** convention only every 2 years instead of annually.

... **Elect officers** by a referendum conducted at the local level instead of by convention.

Gas Cut Required

by Alberta for exports to U. S. by two pipeline firms.

ALBERTA & SOUTHERN Gas Co., Ltd., and Westcoast Transmission Co., Ltd., will have to cut their volume requirements if they hope to get natural-gas export permits from the Alberta government.

The Alberta Oil and Gas Conservation Board has released a report stating that the volume sought by the two companies for U. S. markets exceeds the presently rated gas surplus for Alberta.

The report expresses confidence that future discoveries will provide more than enough gas reserves to cover the volume initially asked by the two companies, but for the present the requirement figures must be cut. The companies were granted until December 31 to change their export applications.

Alberta & Southern had asked to export 4.2 trillion cubic feet of gas to the California market over the next 25 years. The company has 41% of this amount under contract.

Alberta & Southern plans a 1,300-mile pipeline from Alberta fields to the San Francisco area. The company is an affiliate of Pacific Gas & Electric Co.

Westcoast Transmission had asked to export 1.3 trillion cubic feet over 25 years to serve the U. S. Pacific Northwest. It has 51% of the total under contract. The company would move the gas over its present lines into Portland and other northwest areas.

The conservation board said the combined demand of the two companies—5.5 trillion cubic feet—is 1.4 trillion in excess of the amount which the board considers to be surplus to the needs (1) of Alberta over the next 30 years, (2) of all Canada for the next 25 years, and (3) for present export commitments.

However, the report forecasts that in the next 30 years, Alberta's reserves will increase by 51 trillion cubic feet. Present proved reserves are estimated at 23.3 trillion.

The JOURNAL Said . . .

50 years ago

September 20, 1908

Ohio's new law, requiring that tanks, cans, and barrels containing gasoline, benzine, and naphtha must be painted red and plainly labeled, went into effect on September 1.

In a letter to Amos J. Mitchell of Houston, written at San Louis Potosi, Mexico, on September 12, H. C. Mount, an Indiana oil operator who is preparing to drill in Mexico, expresses the greatest confidence in the future of the southern republic as an oil producing country of the first rank. This opinion is shared by practically every operator who has investigated the prospects in Mexico.

25 years ago

September 21, 1933

Secretary Ickes means business in the matter of curtailing production in California fields to the quota of 480,000 bbl. per day set under the oil industry code, according to advices received from Washington by J. R. Pemberton, oil umpire for California.

Secretary Ickes is fully conversant with the fact that infractions of the code are being committed and intends to take drastic action to stop them.

Although engineers supervising construction of the Iraq pipeline are confronted with new and worrisome problems almost daily, construction of the mammoth desert pipeline project is progressing at a satisfactory rate, with construction of pumping stations now about ready to get under way, according to a report on the progress of the construction program compiled by Anglo-Persian Oil Co.

10 years ago

September 23, 1948

If it were the custom of the pipeline industry to single out an individual and bestow upon him the mantle of "Pipe Liner of the Year," in recognition of outstanding service and achievement, the recipient for the current year would undoubtedly be Burt E. Hull.

Hull is president of Trans-Arabian Pipe Line Co., the largest and in many respects the most important pipeline project for the transportation of petroleum liquids now under way.

Pacific Coast states buckled down for a long siege of short supplies of gasoline this week as it appeared there would be no early settlement of the strike of the Oil Workers International Union (C.I.O.) at the refineries of six major companies in California.

Oxygen Expands Cat Cracker

OXYGEN increases throughputs of cat crackers. And it's economical.

Injection of the gas into the regenerator air stream increases coke-burning capacity, and permits higher feed rates. It also allows increased conversion at the constant feed rate.

Tests conducted jointly by Cities Service Oil Co. and Linde Co. (division of Union Carbide Corp.) indicated feed-oil flow can be increased 15% with the standard conversion rate maintained.

Oxygen enrichment of regenerator air strikes at the primary limiting factor in catalytic cracking: Coke-burning rate.

In normal operations the coke is laid down upon the catalyst during the reaction phase of cracking. It then has to be burned off during the regeneration step. The faster the coke is burned off, the faster the catalyst can be put back to work again in the reactor.

Some refiners have attacked the problem by increasing the size of the regeneration blowers to boost the coke-burning rate. Oxygen injection does the same thing with no capital investment and much smaller volumes.

The tests were conducted at Cities Service's East Chicago refinery. Oxygen enrichments up to 27% by weight in the regeneration air were studied.

Experiments were run on Cities Service's 30,000-bbl. fluid unit, operating at 25% recycle rate. Oxygen additions were made at rates up to 150 tons per day, but most of the test data were collected using an oxygen enrichment of 100 tons per day, giving a final oxygen content in the regeneration air of 25½% by weight.

Process control was reported smooth and uniform over the entire range of enrichment. Coke-burning capacity of the regenerator increased in proportion to the additional oxygen available for combustion. Temperature control, oxygen utilization (pounds of O_2 per pound of coke burned), oxygen content in the flue gas, and residual coke on the regenerated catalyst did not change appreciably from normal operating conditions.

Improvement in air performance was indicated when using the higher oxygen concentrations.

The net effect of adding 100 tons per day of oxygen was to increase conversion of the feed oil by approximately 5% by volume at constant feed rate or to increase the feed rate by 15% by weight at constant conversion.

New Radio Hats Make Noisy Job "Quiet

TESTING Dowell's radio hats beside a noisy twin-diesel pumper are Riley Wilson, left, Tulsa World oil editor, and Deacon New of The Oil and Gas Journal.

ABSOLUTELY the latest thing in hard hats—which shoud fit right in with the coming space age—soon will be in vogue for workers of two oil field servicing companies.

They're radio hats—something on the order of Dick Tracy's miniature wrist watch set—designed for communications during noisy fracturing or cementing jobs.

Both systems, one designed by Dowell Division of Dow Chemical Co. and the other by Halliburton Oil Well Cementing Co., eliminate the need of hand signals during service jobs, increasing efficiency and providing additional safety.

Although there are differences in the two radio hats, both have earphones and foot-long antennas, giving the wearer the appearance of a man from Mars with ear muffs.

Designed for the service company employes, the radio hats could be used in other oil field jobs where noise level is unusually high.

Dowell's "derby" . . . Dowell workers literally will be talking through their hats.

A small, two-way, transistor radio, not much larger than a package of cigarettes, is mounted in a specially designed, reinforced fiber glass safety hat. The entire unit weighs 2½ lb.

A small microphone is attached to a strap which fits underneath the nose. The transmitter button and volume-control knob are on the front of the hat.

Dowell engineers say one of the

HALLIBURTON engineer, center, broadcasts radio instructions over walkie-talkie to two workers with radio hats.

and Peaceful"

most important features of the microphone is that it does not pick up background noise, such as high-powered engines operating at full throttle.

The radio is powered by a small 9-volt battery. Its effective range is less than 2,000 ft.—considered sufficient for most well-servicing jobs.

The system still is in the experimental stage, being tested according to requirements of the Federal Communications Commission.

Halliburton's hat . . . Halliburton has two different systems.

One system is wireless, shortwave radio. The engineer or supervisor on a job uses a walkie-talkie to broadcast instructions. Workers have small receiving sets mounted inside their safety hats.

Small earphones are embedded in newly-patented outsize earflaps filled with liquid as a sound barrier.

The other unit is a two-way system requiring wires. This is modified from standard equipment using an amplifier and a differential microphone. Both Halliburton systems use transistors.

The wire system was first field tested last year on a well near Los Angeles. The first field trial of the wireless system was made this summer on a Pan American Petroleum Corp. well in southern Oklahoma.

New Bottom-Hole Heat Pump Melts Oil Block

A SIMPLE, electric bottom-hole heater equipped with a pump has had excellent success stepping up production in stripper wells of Pennsylvania's Middle District.

The equipment was used in experiments at a group of seven wells of Quaker State Oil Refining Corp. and increased production from 200 to 600%. Volumes were not large since the wells all were in the final stages of depletion and producing only about 2.2 bbl. weekly.

The heating unit consists of an enclosed heating coil with thermostat, maximum-minimum control, and a totally enclosed circulating pump.

Designer and manufacturer of the equipment is H. D. Bowman, of Raleigh, N. C., a veteran of the Pennsylvania and West Virginia oil and gas fields.

His idea in designing the heater was to give every consideration to the amount of circulation and heat. So Bowman coupled the unit to the power source with an eight-conductor cable which can be clamped to each joint of tubing. This permits changes in the direction of circulation, control of the heating unit, or disconnection of the thermostat for higher heat if necessary.

The unit may be controlled from the surface. This allows several heaters to be installed in separate wells and operated from one set of controls.

Other variations also are possible, according to Miles B. Blanchard, Quaker State engineer. The heating unit may be installed on the bottom of a pumping or flow string for intermittent or continuous heating of viscous oils while producing.

The problem . . . The Bowman bottom-hole heater was tested in a nearly depleted area where other recovery-stimulating methods had failed.

Wells tested were producing 2.2 bbl. weekly from the Grand Valley or third sand at about 700 ft. in the final stage of depletion.

DESIGNER H. D. Bowman and his electric heater-circulator.

Secondary-recovery programs already had been completed. Bottom-hole heating also had been tried. Wells had been steamed, flushed with hot water and hot oil, and heated with an ordinary electric-heating unit.

One special problem which previous methods had not successfully overcome was heavy paraffin. The paraffin covers the walls of the producing sands and causes plugging of drainage channels into the hole. The paraffin had been recognized as a producing factor for many years, but the many attempts to reopen the drainage channels had met with failure.

The results . . . Blanchard says he believes the success of the Bowman heater is due to its pumping unit.

Bowman theorized before the tests that the electric heater would remove the paraffin from the sand and clean the sand face so that oil could flow into the hole more freely. But he contended that heat alone would not keep the sand face paraffin-free without continuous circulation of the fluid. That's why he incorporated the pump into his unit.

The results were much as Bowman predicted. The 2.2-bbl. producers at first kicked up to 10 and 11 bbl. weekly. Just as important, the production stayed up. The wells nearly 2 years after the experiments still were producing at much higher rates than before treatment.

Blanchard said he believes the heat and circulation treatment broke the water block in the producing sand.

Blanchard said the initial cost of the equipment and the operating costs make it economical for most operations.

Bowman has made arrangements with an eastern manufacturer to make the units but has not started up quantity production.

THIS PERMANENT platform is in action near Summerland as . . .

Socal Drills Off California

STANDARD OIL Co. of California hasn't let any seaweed grow under its feet in getting drilling under way on its offshore parcels in California.

Since the first of this month Socal has started drilling on both of the offshore leases it holds 50-50 with Humble Oil & Refining Co. off Santa Barbara County.

The two parcels represent a cash bonus investment of $19,673,598. Here is the status of each:

. . . **On the 3,840-acre lease** off Gaviota, Socal was drilling below 500 ft. on 1 Standard-Humble-Gaviota State. Drilling is from the long-idle Pacific Driller No. 1, the West Coast's only Gulf-type mobile drilling platform. The platform stands in 86 ft. of water, 4,000 ft. from shore.

. . . **On the 5,500-acre lease** off Summerland, drilling started last week from a newly completed permanent platform constructed in 100 ft. of water 2 miles from shore (photo).

Summerland . . . Socal has taken a little longer than planned to get started on the Summerland parcel.

Socal used the Pacific Driller No. 1 to drill two evaluation tests on the lease last year. The operator didn't reveal results of the tests but soon ordered the permanent platform capable of accommodating 25 wells.

The platform was towed from National Steel & Shipbuilding Co.'s yards at San Diego to the site early in June. Drilling was slated to start by mid-August, but bad fogs delayed completion of the platform.

As California's first permanent drilling platform, it also is unique in that it is designed to drill two wells simultaneously from a single derrick. Initially, however, Socal plans to drill only one at a time.

The Summerland lease went to Socal and Humble in January, 1957, for a cash bonus of $7,250,000. It was the only one awarded by the state under the original terms of the Cunningham-Shell Act of 1955.

The lease carries royalty terms of a flat 12½%, in contrast with the new terms of sliding scale royalties beginning at 16⅔% and rising to 50%, depending on production.

Gaviota . . . Socal has moved the Pacific Driller No. 1 to its Gaviota parcel and thus became the first of three successful bidders at July's offshore lease sale to get into operation.

Socal-Humble actually was high bidder on two of the five parcels offered, but the state has delayed awarding the lease, on Parcel B, possibly because the bid of $770,838 was too low. Consultants and the staff of the State Lands Commission are studying the Parcel B bid and will make recommendations later.

Socal-Humble did, however, get the Parcel C lease—Gaviota—for a high bid of $12,423,589.

The other two parcels went to a group of 42 companies and individuals headed by Phillips Petroleum Co., E. W. Pauley, and Kerr-McGee Industries, Inc., for bids totaling $18,650,000 (OGJ, July 7, p. 72).

Cut in Depletion

gains headway in Congress, Anderson tells oil men.

SEN. Clinton P. Anderson (D-N.M.) warned the oil industry last week that sentiment is growing in Congress to cut depletion allowances.

Anderson, chairman of the joint committee on atomic energy, called on the industry to support a Congressional review of the allowance. Congress, he said, is certain to review oil and gas taxing policies at its next session.

"I do not hold that there is anything sacred about percentage depletion," Anderson said. "However, an arbitrary reduction in depletion would, to that extent, reduce the funds available for essential exploration and discovery which are the only means of replenishing our petroleum supply."

Anderson said there is a "seeming trend toward eventual reduction of the present depletion rate," and Congress needs to conduct an unbiased investigation of the economics of the industry's tax structure.

"In the past, investigation by the Congress, in an atmosphere of calm, always has confirmed the need for depletion allowance," he said.

Efforts to reduce the allowance at the last session failed, but advocates of the cut got more support than in prior years (OGJ, Aug. 18, 120).

Anderson made his remarks last week before the petroleum industries committee of New Mexico.

Congrats and $25 to John R. Ewing, P. O. Box 174, Broussard, La.

Automation and quality control are two of the most important factors in modern manufacturing . . and especially in the making of Lone Star API casing, tubing and line pipe. Lone Star electric-weld pipe is made in America's most ultra modern steel plant . . where every length is given multiple exacting tests in our rigid quality control program. Result: strong, tough pipe for dependable service.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

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Costs Key to Oil's Future Energy Role

THE OIL INDUSTRY is facing a quarter-century fight with coal and nuclear energy for the world power market.

The competition between conventional fuels and atomic energy will arise first in the high-cost areas of the world—with Japan and Western Europe the best prospects.

But this development could occur also in parts of the United States, especially if imports are restricted unduly or some unforeseen influence comes into play.

Large-scale atomic power plants will become truly competitive with conventional plants for base-load purposes by the middle 1960's in the high-cost energy areas. Within the next 5 years or so they will be able to compete for peak-load capacity.

Those are the predictions of the National Planning Association in a report on nuclear energy and world fuel prices.

The NPA is a nonprofit study group working with funds granted by Resources for the Future, Inc., and the Ford Foundation. The report was written by Cornelius J. Dwyer, former head of the industrial specialist division of the Foreign Operations Administration and now a New York consultant.

Role of politics . . . Dwyer sees political rather than economic factors dictating the pace of nuclear development over the next 5 or 10 years.

Europe's dependence on Middle East oil is already so great that Europeans are willing to pay a fairly high price to develop alternative sources of energy as rapidly as possible, he says.

But even under the most optimistic assumptions regarding the rate of nuclear power plant building, Europe's dependence on the Middle East will be greater a decade from now than it is today. It will be still greater by 1980—provided oil is not cut off from the free world.

"Needless to say, the Middle East will be correspondingly dependent on revenue from its sales to Europe," Dwyer comments. "The bargaining power is not all on one side."

Nuclear power will move ahead in this country more because the U. S. has a technical lead and because of the international interests involved than because relative costs warrant it, Dwyer believes.

"Beyond the experimental stage, hard economics will largely determine the rate of development, unless rigid oil-import restrictions result in raising internal energy costs artificially," he says.

Big demand ahead . . . Dwyer estimates that free-world energy requirements in 1980 will call for the production of between 29.4 and 52.4 million bbl. of oil and 25,455 to 32,915 million M.c.f. of natural gas daily.

To maintain the level of a 15-year supply underground, the industry will have to develop proven reserves by 1981 of between 171 and 295 billion bbl. of oil.

The 1980 needs of various areas as estimated by Dwyer are:

. . . United States: 14.5 to 22.2 million bbl. of oil and 21,420 to 26,130 million M.c.f. of gas.

. . . Canada: 1.6 to 1.9 million bbl. of oil and 845 to 990 million M.c.f. of gas.

. . . Free Europe: 4.3 to 13.3 million bbl. of oil and 670 to 1,005 million M.c.f. of gas.

. . . Latin America: 3.6 to 5.6 million bbl. of oil and 420 to 590 million M.c.f. of gas.

. . . Other Eastern Hemisphere: 5.4 to 9.4 million bbl. of oil and 2,100 to 4,200 million M.c.f. of gas.

The figures do not raise the question whether these quantities can be found. The burden is on technology to keep pace with demand increases so that oil and gas can be found and produced at no significant increase in real costs, Dwyer explains.

Future of prices . . . The vast reserves of Rocky Mountain oil shales and Canadian tar sands may put a ceiling on possible increases in U. S. crude prices, he says.

But Dwyer points out that while both are reported on the threshold of being economically producible, they were on the same threshold a generation ago. They may still be there a generation from now.

The main point made by Dwyer in this connection is that there are no technical reasons to expect increases in the real costs of conventional fuels over the next quarter century.

"Therefore, if nuclear energy is to compete with these fuels, it must do so by bringing down its costs, rather than by waiting for the costs of conventional fuels to rise," Dwyer concludes.

Rivalry from coal . . . Dwyer foresees a different pattern of competition between coal and oil when nuclear power becomes a real factor.

The problem of the utilities concerned will be to make a decision good for 20 years or more, whether to build an atomic plant or a conventional plant.

With nuclear plant costs known, utility men will want some sort of guarantee from oil or coal suppliers that delivered fuel costs will not, on the average, be so high that total costs will exceed those of nuclear plants.

"Both coal and oil companies should find it possible to make such contracts, since shipping and production from existing reserves can be dedicated to the supply of the contract," Dwyer says.

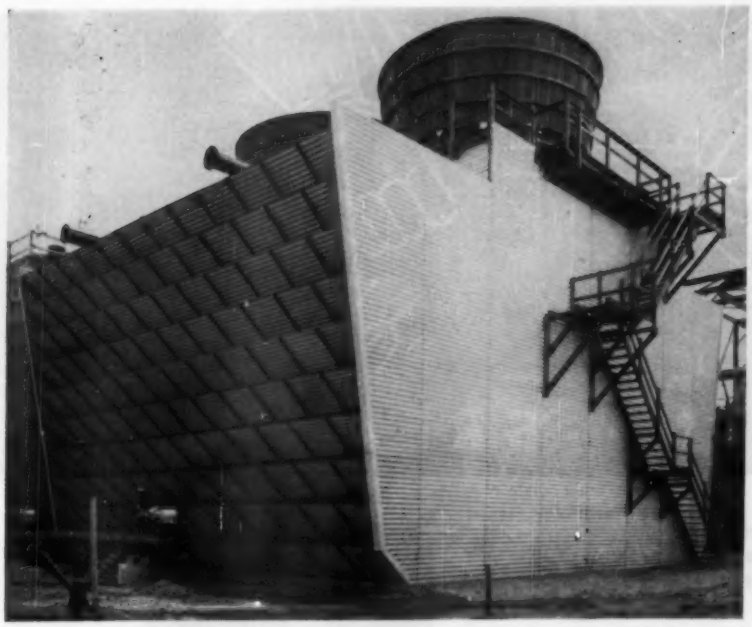
The biggest risk is from unilateral raising of taxes by oil-producing countries by changing concession terms. This cannot be guarded against, he believes.

But bidders will also have to estimate what inflation is likely to do to operating costs, a minor element in total costs, and the probable trend in prices for alternative products—gasoline and middle distillates—that could have been produced from the fuel oil committed, Dwyer warns.

"At the moment, with oil in long supply, with new and promising petroleum provinces in the initial stages of development, and with marginal costs of production below 10 cents per barrel in the best fields, fuel oil prices could obviously be cut substantially if competition required it," Dywer concludes.

"This condition is unlikely to change over the period concerned. Nevertheless, the present and potential claims of other products upon the barrels of oil would probably cause oil companies to withdraw from the competition for new, large-scale power plants if they would have to sell fuel oil below about $1.50 per barrel, that is, when nuclear plants can produce at 6.6 mills per kwh., at 50% plant factor.

"Competition will still remain vigorous throughout the period for fueling of small power plants, shipping, etc. And there is always the possibility that major technological breakthroughs in the design of fusion, fission, or fossil-fuel power plants or in petroleum exploration and production could alter the competitive position in ways not now possible to foresee."



ASBESTOS CEMENT replaces redwood louvers in this cooling tower.

Cooling Tower Has Innovation

THERE'S a new look in cooling towers at Esso Standard Oil Co.'s Baton Rouge refinery.

The conventional redwood louvers have been omitted in a new tower constructed as part of an alkylation-unit expansion. Instead, asbestos cement has been used to house the tower, including the use of large asbestos-cement louvers.

Structural design has also been changed, with the towers flaring out from the bottom to the top of one side, rather than being box-shape. This feature provides a graduated cooling effect with the air-water contact being greater near the top of the tower.

The cooling tower is used in the refrigeration cycle of the alkylation process. The tower was designed to reduce the possibility of freezing during winter months.

How it works . . . In operation the hot water is pumped over the top of the tower and passes downward and inward over baffling.

Air drawn in through the side of the tower cools the water. More air contacts water when it is the hottest—at the top of the tower. The flared design of the tower cuts down on amount of air contacting the water as it travels downward. This avoids overcooling and still gives a high rate of cooling in the upper section.

In addition, the new-type louvers are easier to apply. Possibility of leakage is reduced because fewer joints are required.

The new tower is also characterized by flared fan stacks which taper to a smaller diameter at their bases. These especially tall stacks—14 ft.—are used to reduce the amount of horsepower required to move air through the tower.

Marley Co., Kansas City, designed and is building the tower.

PROCESSING BRIEFS...

Celanese Corp. of America will double capacity of its acetic acid plant at Pampa, Tex. The new facilities, to be completed late in 1959, will give the plant a capacity of 240 million pounds yearly, about 15% of the nation's total requirements.

Dow Badische Chemical Co. will start clearing a site near Freeport, Tex., within a few weeks to construct a plant to manufacture products derived from acetylene. Plant construction will begin in early 1959. Acetylene feed stocks and other materials and services will be provided by Dow Chemical Co.

Malco Refineries, Inc., has a new UOP hydrofluoric alkylation unit on stream at Artesia, N. M. Charge capacity is 1,056 bbl. per stream day.

Automatic control of process units is the aim of a new study begun by Standard Oil Co. (Ohio). Teaming up with Thompson - Ramo - Wooldridge Products Co., Sohio will look into the possibility of applying the digital computer to process optimization. They will follow the newly developed "systems engineering" approach. They expect to come up with new techniques and equipment to make process units operate at their most efficient level.

Carter Oil Co. is converting a bauxite desulfurizer into a naphtha-distillate Hydroformer at its Billings, Mont., refinery. Capacity of the Hydrofiner will be 10,275 bbl. daily. The conversion is part of a quality-expansion program now under way at Billings. Also included are a 2,300-bbl. HF alkylation unit and a light-ends debutanizer. Refinery Engineering Co. of Tulsa is prime contractor on the units, which are scheduled for completion early in second quarter of 1959.

Bay Refining Co. will build a hydrofluoric alkylation unit with a 750-bbl. daily capacity at its Bay City, Mich., refinery. Completion is scheduled for June 1959.

Also for Refiners . . .

IN THE NEWS: U. S. starts talk about increasing federal gasoline tax by 1 or 2 cents next year (p. 51) . . . Signal-Hancock merger means two new refineries, one for San Francisco and another in the Pacific Northwest (p. 52) . . . OCAW convention is taking a new look at union's stalled 1958 wage drive (p. 58) . . . Tests show oxygen boosts throughput on cat crackers (p. 59) . . . Asbestos-cement louver replaces redwood in cooling tower (p. 65).

PLUS THESE TECHNICAL REPORTS: Regeneration of alkaline solutions used in mercaptan extractions (p. 89) . . . The hot-potassium carbonate process for CO_2 removal from gas (p. 99) . . . The economics of acid-gas removal by hot carbonate (p. 106).

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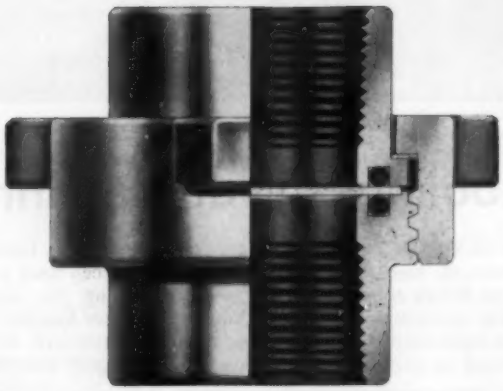

Figure 110

CERTIFIED LABORATORY TESTS PROVE THEIR EFFICIENCY*

RESISTANCE TEST

Size	Volts Impressed	Resistance at Start—ohms	Resistance at End—ohms	Variation in resistance during time voltage was impressed (1 minute)
¼"	1,000 D.C.	11,000,000	11,000,000	None
2"	1,000 D.C.	30,000,000	30,000,000	None

BREAKDOWN TEST

Size	60 cycle Breakdown Voltage	Location of Breakdown	Damage to insulating Material
¼"	1,500 RMS	Air gap between mating parts	None
2"	3,500 RMS	Air gap between mating parts	None

*By R. R. Crookston & Associates. Certified copies upon request.

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Gas Merger Ends Peril

. . . of financial trouble for Pacific Northwest, El Paso Natural's Kayser testifies at historic FPC hearing.

THE Federal Power Commission, backed by a court refusal to interfere, has finally opened hearings on the proposed merger of the El Paso Natural Gas Co. and Pacific Northwest Pipeline Corp.

El Paso already owns more than 99% of the stock of Pacific Northwest, but the two companies have operated separately. El Paso now seeks to take over the physical assets of its sister company and operate as a single entity.

El Paso Natural claims the merger will provide more efficient and economical service to customers, with access to assured reserves over longer periods of time and at lower unit costs.

A test case . . . The El Paso-Pacific Northwest merger case is of more than nominal importance. It has become a test of the authority of the Justice Department to interfere in FPC matters.

The department filed a complaint against the companies in July 1957. It alleged that El Paso's acquisition of more than 99% of Pacific Northwest's outstanding common stock violated Section 7 of the Clayton Act (OGJ, July 29, 1957, p. 112).

The government charges were answered by El Paso with a claim that the Clayton Act was never intended to apply to companies supervised by a federal agency. El Paso contended that the FPC is the proper body to consider and pass on the merger, including any antitrust phases.

The FPC also announced that it would go ahead with its study of the merger without regard to the Government's suit.

The position taken by El Paso and the FPC won support earlier this month from the Federal District Court at Salt Lake City. That court denied the Justice Department's motion to halt the FPC proceedings until after its suit was tried.

Ten states advised the FPC at the opening of the hearings they wish to take part in the case.

So far, only California has announced that it will oppose the merger. Its objection is based on fear the move would leave the state in the position of being served by "a single supplier."

Paul Kayser, president of El Paso, asserted that the point is not well taken. There are now two projects—by Pacific Gas & Electric Co. and Trans Western Pipe Line Co.—to supply natural gas to the state, he said.

Texas, Arizona, New Mexico, Nevada, Wyoming, and Idaho have advised that they will support the merger. Utah, Oregon, and Washington have not indicated their position.

Strained finances . . . Kayser appeared as the first witness before the FPC to explain the purposes of the merger.

Pacific Northwest "is now in difficult financial position, cramped for new capital to provide for needed expansion," he testified.

Merged with El Paso, however, Pacific Northwest would be able to earn its rate of return "without radical increase in its rates," Kayser said.

Kayser disclosed that the two companies have completed a series of deals by which 400 million cubic feet of gas a year originally destined for eastern markets will go to California.

A key advantage of the merger is that all customers of both companies will have access to potential reserves of the Rocky Mountain region, British Colombia, and southwestern Alberta, he pointed out.

Kayser said that these reserves, to which Pacific Northwest is a channel, constitute "one of the greatest potential reserves" of gas in North America.

The merged company would become the world's largest gas-transmission system. It would have more than 2,300 miles of line with 339,000 M.c.f. daily capacity and reserves of 11 trillion cubic feet.

Short Cut to Gas Processing

A ONE-SHOT operation to sweeten and dehydrate sour gas and to recover elemental sulfur is sparking interest among natural-gas processors.

Still in its pilot-plant stage, this single Townsend process bypasses a number of conventional steps in processing sour gas. But it is also adaptable to existing plants in its ability to handle a wide range of hydrogen-sulfide concentrations contracted from process-gas streams.

The new approach uses an hygroscopic organic liquid as a catalyst and reaction medium. Triethylene glycol or diethylene glycol are preferred.

Laurance S. Reid and F. Mark Townsend of the University of Oklahoma outlined the Townsend process last week at a Natural Gasoline Association of America meeting in Casper.

How it works . . . In a typical application involving conversion of sour natural gas to pipeline quality only two towers are needed. Sour gas is fed near the base of the reactor at line pressure and atmospheric temperature. In rising through the column it is contacted with a down-flowing solution of glycol, water, and sulfur dioxide. Water is controlled to a maximum of 10 weight per cent. Sulfur dioxide is produced in a sulfur burner.

The reaction is instantaneous at the liquid-vapor interface. Fine sulfur particles are removed from the base of the reactor as glycol slurry. In a heated settling drum, liquefied sulfur stratifies and glycol is decanted, cooled, and returned to the top of the reactor. Excess sulfur dioxide is stripped off and recycled.

Sweetened gas from the reactor passes overhead to an absorber where it is contacted with glycol for removal of final traces of sulfur dioxide and water.

Other uses . . . This one-step operation can be altered to handle acid gas from amine units.

In such a case, one-third of the hydrogen-sulfide stream is burned to produce the required SO_2. Burner flue gas is cooled and recombined with acid gas before contacting with glycol in the reactor. As in the sour gas treating setup, the glycol carries excess SO_2 recycled from the absorber. This excess is the key to complete recovery of sulfur.

Developers of the process believe that it might also pay out as a final clean-up device on some conventional sulfur-recovery units. Placed on the vent-gas line, it would serve as a scrubber and condenser for sulfur dust and vapor and would convert any unreacted hydrogen sulfide carried over from the unit.

The process is insensitive to carbon dioxide. It alone would not suffice in producing pipeline gas if the CO_2 content of the original gas is higher than specification. Such a case would call for amine treatment to remove H_2S and reduce CO_2. Then the Townsend process could pick up on recovering sulfur from the extracted hydrogen sulfide gas.

Gas-Unity Plea a Dud

. . . at INGAA sessions. Producers say new reserves most vital to industry—not big campaign for new customers.

PLEAS for all segments of the gas industry to pull together as a team fell pretty much on deaf ears among producers attending the Independent Natural Gas Association of America last week.

A half dozen speakers representing distributors and pipelines hit the theme of a campaign to promote more use of gas in competition with electricity.

They cited a slowdown in expansion of natural-gas use and a growing acceptance of electrical appliances. They asked the producers to give financial support to a television series, a public-relations program, and other forms of advertising and promotion.

Corridor conversations reflected a marked lack of enthusiasm on the part of producers. Many of them felt that the persons now asking for unity were largely responsible for the troubles growing out of the Phillips decision.

As one producer expressed it: "The boy who owns a football is always asked to join the team. Now that we have the gas, the pipelines and distributors are inviting us to play ball with them."

An answer . . . But the official answer of producers was given by John E. Swearingen, president of Standard Oil Co. of Indiana, when his turn came on an all-day panel discussion.

The real problem of the industry, Swearingen asserted, is not new uses for gas but supplies to meet the present demand.

"The producer," he said, "sees natural gas as an important but secondary part of his oil and gas-producing business. He is newly subject to federal regulation on his gas production, and for the last 4 years this has brought him nothing but headaches. He sees no early resolution to the chaotic condition where the Federal Power Commission is supposed to regulate producers but has failed to establish standards for its own or the producers' guidance.

"He sees the price freeze imposed as an alleged temporary measure failing to give him what he considers a fair price for his commodity. He sees the cost of everything he buys going up, the success of his finding efforts going down, and the price of his product largely fixed. He sees a growing demand ahead for gas—but at least a part of this growth will come at the expense of the market for his oil.

"Little wonder, then, that gas producers may be less enthusiastic in promoting use of natural gas than transporters, distributors, or appliance manufacturers."

New reserves vital . . . Unless producers are successful in discovering additional reserves of gas, Swearingen said, the finest plans for expansion of the industry will be still-born.

"The big job ahead for all of us 10 and 20 years from now is going to be not how to sell more gas but how to supply our present customers and meet the enormous demands from new people who want to become customers," Swearingen said.

"Every year producers must discover three times annual production to maintain a 20-year reserve supply without reducing our present reserve ratio.

"Producers haven't discovered that much gas since 1947. During these 11 years we lived in part on inventory, and the ratio of reserves to annual production dropped from 29:1 down to 21:1.

"The enormous job ahead can be done only if gas producers are willing to look for gas. The Supreme Court may decide producers are to be regulated; but under our present democratic system neither the Supreme Court nor the FPC can force producers to spend their own money exploring for gas.

"As long as federal regulation of producers continues on the present basis, producers will be reluctant to spend money looking for gas; and what gas they do find they will attempt to sell in the unregulated intrastate market rather than to the regulated interstate market."

Cosden Aims at Bigger Market

COSDEN Petroleum Corp. is breaking out of its West Texas straitjacket, reaching for bigger markets and opportunity for faster growth.

The aggressive integrated independent has been dissatisfied with a growth rate limited to the rise of the economy in its present market area. Also a new competitor—El Paso Natural Gas Products Co.—is making inroads in the west end of its territory. So Cosden is bidding for a share of the Midwest and Ohio Valley products market, one of the biggest and most competitive in the country.

The first step in this direction was taken last year when Trust Pipe Line Co., owned by the company's pension trust fund, was built from Abilene to Wichita Falls. This opened the North Texas area to output of the interconnected Big Spring, Colorado City, and Hawley (Abilene) refineries.

The second step is now under way. It's an extension of the pipeline system with a 47-mile, 6-in. line to Duncan, Okla. There it will connect with the Oklahoma-Mississippi River Products Line and through it to the Great Lakes and Little Big Inch lines serving the Midwest and Ohio Valley.

Holder Construction Co., Snyder, Tex., is building the line under management of Pipe Line Technologists, Houston, which has a turnkey contract. The line is to be turned over to Cosden ready for operation in November.

Cosden's aims . . . R. L. Tollett, Cosden president, says the company is spending $1,000,000 on the project, called River Pipeline Co.

"If we are to grow more rapidly," he said last week, "we need a highway out of this area, and this pipeline is it."

Powered by a 75-hp. pump at Wichita Falls, the line will provide about 5,000 bbl. daily capacity to Duncan, where four 30,000-bbl. tanks will be built at the Oklahoma-Mississippi River terminal.

Indiana and Ohio will be the first targets, Tollett says, and will be reached through the Little Big Inch, recently converted from gas to products by Texas Eastern Transmission Corp. Although Cosden markets some of its own products, two-thirds of its volume is custom refined for others. Cosden products in this new venture will be handled entirely by independent jobbers and majors. The line is designed to handle a full range of products, including propane, but shipment of LPG will depend on Oklahoma-Mississippi River's ability to handle it. The line doesn't handle these light products at this time.

River Pipeline will be a common carrier and thus open to Continental

Oil Co. and American Petrofina for shipments from their Wichita Falls refineries. No commitments have been obtained from either, Tollett says, but expressed confidence he could get enough traffic for the line.

Tollett expects the new outlet to lead to expansion of Cosden refining capacity, although nothing definite is planned. The 7,000-bbl. Hawley refinery has been shut down.

Fire Recovery Planned

ANOTHER Texas independent will take a crack at hiking oil recovery from a played out reservoir through underground combustion.

Conka Production Co. plans to inject air and ignite hydrocarbons in the Fry (Strawn) sand under its A. J. Newton lease in Brown County Regular field of West Central Texas.

Injection into the 12-ft. thick pay at 1,250 ft. will be through one well. The first well in the reservoir was completed in 1929. Vacuum was pulled on wells on the lease before Conka acquired it. The vacuum was dropped about a year ago and the lease waterflooded.

This is the second application by an independent in Texas in the past few weeks. Recently John Deford, Abilene operator, got a permit to conduct a similar operation in the Amerada sand under his E. E. Knight lease in Coleman County Regular field.

Pecos Well Nears 25,000 Ft.

THE WORLD'S deepest well may pass a milestone in oil history this week. It may hit 25,000 ft.

Phillips Petroleum Co.'s 1-EE University drilled below 24,757 ft. last week at the rate of about 35 ft. per day.

Operators of the well in Pecos County, Texas, are not, however, all smiles. In fact, they're worried. While drilling has progressed satisfactorily, the base Ellenburger formation has eluded them. It was expected several hundred feet uphole, but the bit has remained in the Simpson.

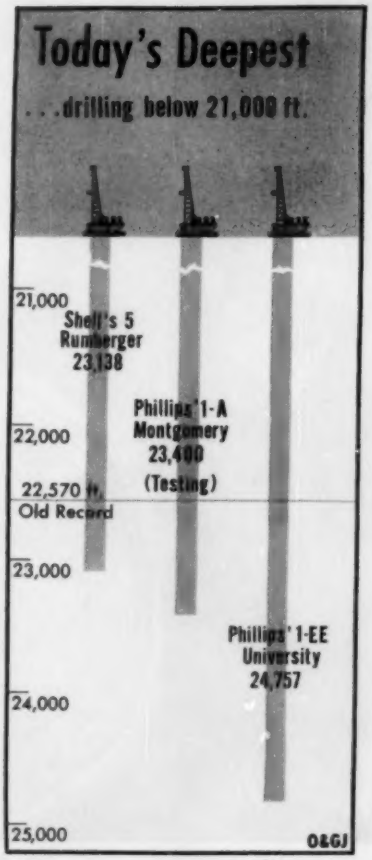
Just how far beyond 25,000 ft. Phillips can be expected to go in search of the Ellenburger is a decision to be made at the top executive level. In any event the projected depth is still 25,000 ft.

The 1-EE University months ago broke the old record of 22,570 ft., set in South Louisiana in 1956.

Another Pecos County well, Phillips' 1-A Montgomery, also has broken the old mark and bottomed at 23,400 ft. Operators now are testing.

The world's third deepest well, Shell Oil Co.'s 5 Rumberger, passed the old record in August and last week drilled below 23,138 ft. toward a 24,000-ft. objective.

The Shell well is located in the Elk City, Okla., field.



PIPELINE BRIEFS . . .

Interprovincial Pipeline Co. has completed a 6-year program expanding and looping its lines from Edmonton to Superior, Wis. The company now has double lines the entire distance except for a segment between Port Credit, Ont., to Superior. The new 24 and 26-in. line looping augments the original 16, 18 and 20-in. lines and gives Interprovincial a capacity of 275,000 bbl. daily out of Edmonton, 376,000 out of Cromer, Man., and 258,000 out of Superior.

Transcontinental Gas Pipe Line Corp. has contracted with H. C. Price Co. to lay approximately 65 miles of 24-in. pipe in Louisiana. The line starts at the Mississippi border at a point about 6 miles north of Liverpool, La., and extends south through Louisiana to the Mississippi River. Construction began last week.

Southern Natural Gas Co. has let pipeline contracts to Western Pipe Line, Inc., and Latex Construction Co. of Georgia. Western will construct 112 miles of 12-in. and various sizes of pipe in southern Louisiana. Latex's contract calls for 22 miles of 14-in. in the vicinity of Tallapoosa, Ga.

On another job, Southern Natural awarded a contract to Houston Contracting Co. for laying 40 miles of 24-in. pipe from a point near Gallion, Ala., toward Elmore, Ala. Work will start about October 15.

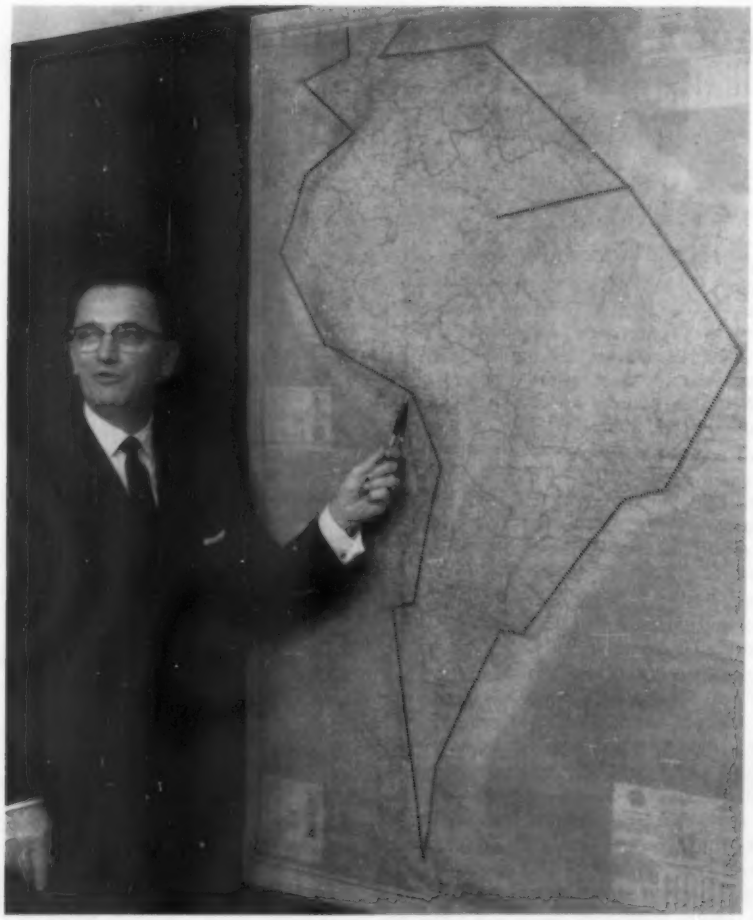
Interstate Oil Pipe Line Co. is planning a 35-mile, 6 and 8-in. extension of its system in the Brookhaven, Miss., district. It will provide service to the recently discovered Raleigh, Martinville, and Magee fields in Simpson and Smith counties. Irish Engineering Service of Shreveport, La., will recondition and coat the pipe. A construction contract will be awarded soon.

Also for Pipeliners . . .

IN THE NEWS: Gas producers cautioned about using cost data in their price cases before FPC (p. 53) . . . Journal survey shows producers have big plans for LACT (p. 54) . . . Alberta requires firms to cut their proposed gas exports (p. 59) . . . El Paso defends its merger deal with Pacific Northwest in hearing before FPC (p. 67) . . . Cosden extends its products line in move to reach Midwestern markets (p. 68).

A complete list of pipeline construction projects appears in the last issue of each month. New projects are reported weekly in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: New turbine-type meter for custody transfer (p. 83) . . . Tough ditching slowed progress on the Cherokee project (p. 86).



"AMBASSADOR" Irizarry checks his 20,000-mile itinerary. On the trip . . .

Latin Oil Men Get an Invitation

DR. OSCAR B. IRIZARRY, editor of Petroleo Interamericano, becomes a goodwill ambassador for the oil industry during the next 3 months.

Dr. Irizarry will deliver personal invitations to officials and oil leaders in 13 Latin American countries to attend next year's International Petroleum Exposition in Tulsa and World Petroleum Congress in New York.

The IPE will be held May 14-23 and the Congress May 30-June 5.

Twice before Irizarry has made the Latin American swing on behalf of the IPE and the governor of Oklahoma, and this year he is doubling up to help the World Congress.

As editor of the Spanish-English sister publication of The Oil and Gas Journal, Irizarry is well known in the Latin countries.

Between now and December 18 he will visit Cuba, Puerto Rico, Venezuela, Trinidad, Brazil, Uruguay, Argentina, Chile, Bolivia, Peru, Ecuador, Colombia, and Panama. While in the countries he will visit the principal oil fields, and refineries.

His talks with governmental officials have been arranged through the embassies in Washington. Last May, Irizarry made the rounds of the embassies with personal invitations to diplomatic leaders.

Irizarry will fly 20,000 miles. He will carry with him IPE invitations signed by Gov. Raymond Gary of Oklahoma and W. K. Warren, president of the IPE and Warren Petroleum Corp.

Texas Trims Allowables

TEXAS OIL PRODUCERS will be allowed only 11 producing days for October in a move by the Texas Railroad Commission to bring crude supply nearer in line with a declining demand. Texans produced on 12 days in September.

The October allowable is expected to produce 2,957,936 bbl. daily, a decline of 246,555 bbl. daily from crude produced by the current allowable.

Purchasers of Texas crude, however, nominated even less for October than the allowable will produce. Their nominations totaled 2,778,376 bbl. daily, a 116,356-bbl. drop from September's nominations.

Bureau of Mines estimates of Texas demand for October called for 2,710,000 bbl. daily, a 35,000-bbl. decrease from September.

Smackover Oil

pay looms for Mississippi at Gulf's Eucutta Field well.

MISSISSIPPI is another step nearer to getting its first oil production from its sparsely explored deep Smackover formation.

A well in Eucutta field, in Wayne County, swabbed small quantities of 27.1°-gravity oil while testing this lower prospective producing horizon. Recovery on one 23-hour test was 8 bbl.

So far, the state's only Smackover production has been from two gas-condensate wells in Loring field, in Madison County. There the gas contains a high content of hydrogen sulfide and CO_2 which has created difficult production problems.

The Eucutta well, Gulf Oil Corp. 1 Eucutta Unit 9, previously had produced from the 9,800-ft. Lower Cretaceous-Rodessa sand, in which it had been completed last January. With production from that zone depleted, the well has been deepened from its former total depth of 10,725 ft. through the Jurassic-Smackover formation to 12,119 ft.

Testing is in acidized open hole from 11,860 ft. to plugged-back depth of 11,874 ft.

Cycling Plant Approved

HUMBLE Oil & Refining Co. has a green light from the Texas Railroad Commission to build its huge King Ranch cycling plant in the Seeligson area of South Texas.

The plant, with planned capacity of 300,000,000 cu. ft. daily, is the central unit in a Humble program to cycle gas caps of 24 separate reservoirs in four fields in three counties (OGJ, Sept. 15, p. 114).

Fields involved are Borregos, Seeligson, Tijerina - Canales - Blucher, and Stratton in Nueces, Kleberg, and Jim Wells counties.

Public Support Sought

. . . for revamping Venezuela's scandal-ridden petrochem program. Honorary president, executive council named.

VENEZUELA'S minister of mines and hydrocarbons took his case to the people and told Venezuelans baldly that one of the country's pet projects, the government-sponsored petrochemical program, is a national scandal.

Treading deliberately on dangerous ground, Dr. Carlos Perez de la Cova made a nation-wide broadcast asking the public to support his plans to reorganize Venezuela's Petrochemical Institute. He told the People Petroquimica has been guilty of inefficiency and waste and said it's the duty of the provisional government to put things right.

The next day, Dr. Perez took the first step in his program of putting Petroquimica on a sound basis. He named the highly respected former director of hydrocarbons, Dr. Gustavo Thery Fombona, honorary president of Petroquimica. Then the minister appointed a new executive council to work on Petroquimica's rejuvenation.

His plans . . . Dr. Perez wants Petroquimica to remain in the hands of the government. But he proposes to put it on its feet by making temporary contracts with experienced foreign companies.

The unfinished petrochemical complex at Moron has been one of the biggest scandals of the overthrown dictatorship. The minister repeated to the nation some of the findings turned up by the provisional government several months ago (OGJ, June 23, p. 86).

He said that $150 million has been invested in Petroquimica in 3 years, with only a 2,900-bbl. experimental refinery on stream and several other unfinished units to show for it.

Dr. Perez, an outspoken supporter of private company operations in Venezuela, said that experienced and competent personnel must be found to operate Petroquimica, with Venezuelans eventually taking over after training.

As it now stands, he said, so much capital has been sunk into the program it is "almost impossible to calculate rationally the operational cost." The program was financed with what he called burdensome foreign debts.

Dr. Gustavo Thery Fombona
. . . to assist reorganization.

Opposition seen . . . He anticipated that his reform program will face obstacles and criticism.

He proposes to cut excessively high salaries and shuffle personnel. Once the program is on solid ground, he said, future governments will be able to determine its industrial and commercial policy.

Calling a spade a spade conceivably could cost Dr. Perez his job when the new government comes in. He said he did not expect it to add to his personal popularity, but that he believed it essential to "tell the public the whole truth."

Dr. Thery's appointment as honorary president of Petroquimica was the first move in the reorganization.

Other members of the new executive council are Dr. Gustavo Tejera, Dr. Miguel Ravard, Dr. Jose Sanabria, and Dr. Frank Salas. Alternates are Henry Boulton, Dr. Alfredo Anzola Montauban, Dr. Marcel Carvallo, Dr. Maximo Sielberg, and Oscar Morales.

Jamaican Refinery Opposed

THE Jamaican refinery project will fall through if the Trinidad Government has anything to do about it.

Jamaica has approved plans for a plant to be built by Jamaica Oil & Chemical Co., Ltd., which will more than cover local demand (OGJ, Sept. 1, p. 124). This ruffled the feathers of Trinidad, whose privately owned refineries supply virtually all Jamaican demand.

The plant may bring to a head a dispute over free trade in the new West Indies Federation. Trinidad says it will fight the refinery in the federation parliament.

Price Slash Puts

Saudi Arabian crude below Neutral Zone competitor.

CRUDE from Safaniya field in Saudi Arabia now sells for a shade less than the posted price of its nearby competitor, Wafra field in the Neutral Zone.

Offtaker companies of Saudi Arabian crude lowered the price of the offshore oil by 14 cents per bbl. The price is now $1.65 per bbl. for 27° to 27.9°-gravity crude. There is a 2 cents per barrel. differential for each degree change in gravity.

The new price on an adjusted basis is 1 to 2 cents per bbl. under last month's posting for Wafra crude by Getty Oil Co. Wafra crude, posted for the first time, is listed at $1.61 per bbl. for 23.5° to 24.4° gravity, with a 2-cent differential for a degree change in gravity (OGJ, Aug. 25, p. 66).

The Safaniya revision is the first in the Middle East since Getty Oil posted prices. Safaniya crude is more nearly like Wafra than any other in the area. Both crudes are heavy, and both have a high sulfur content of over 3%.

Lake Maracaibo Surveyed

SEISMIC work is under way on open acreage south of present concessions in Venezuela's Lake Maracaibo.

Richmond Exploration Co. is sponsoring the survey. The Standard Oil Co. of California subsidiary has a host of partners, three of them popping up for the first time in recent years in connection with the lake.

The lake newcomers are Socony Mobil, Sinclair Oil, and Union Oil of California. Union Oil's participation marks its first appearance in Venezuela. Other survey partners include Phillips Petroleum, Signal Oil, San Jacinto Petroleum, Continental Oil, The Texas Co., Mene Grande, and Sharples Oil.

Brazilian Firms Vying

. . . for Bolivian exploration rights. Successful bidders expected to seek outside financial and technical help.

THE BRAZILIAN Government is expecting to pick the private Brazilian companies who will operate in Bolivia by the middle of next month.

The deadline for submitting bids for rights to explore the 3½-million-acre Comision Mexta region was last week. Once the Brazilian Government gives the nod to successful bidders they must also be approved by the Bolivian Government.

Reports from Rio de Janeiro last week indicated that a number of Brazilian firms are interested in the Bolivian operation, but only one group has so far been identified. Petroleo Andino, S. A. was organized in Brazil for the express purpose of bidding on the Bolivian project. It is backed by some of the same Brazilian business interests who earlier this year organized Petroleo Guaran, S. A. (Pegasa) and were awarded a 10-million-acre concession in Paraguay.

Any company selected for the Bolivian operation is almost certain to look for both financial and technical help in either the U. S. or Europe. With Brazil's own oil industry firmly in the hands of Petroleo Brasileiro (Petrobras) the country has no private companies capable of undertaking an oil operation alone.

The background . . . The bidding last week in Rio de Janeiro is the first concrete step toward development of the Bolivian region which was set aside for joint Bolivian-Brazilian operations more than 20 years ago.

Bolivia originally set aside 3,500,000 hectares (about 8,645,000 acres) west of Santa Cruz for the joint development. It was to pay Brazil for building a railroad between Corumba, Brazil, and Santa Cruz.

Two years ago when Bolivia welcomed private oil companies back to the country, negotiations between the two governments began again. Bolivia balked flatly at letting Petrobras, a Brazilian Government agency, operate the area. A plan to organize joint Brazilian - Bolivian private companies for the project was shelved during the talks also. About the same time the original area was cut to its present size of slightly less than 3,500,000 acres.

Under the terms of the new agreement, the private Brazilian companies may be financed by foreign capital but no more than one-third of the voting stock may be in foreign hands. Any oil discovered in the region must go to supply Brazilian demand. Production would be sold to Petrobras which may build a pipeline to move the crude.

The Comision Mexta area is almost surrounded on three sides by concessions which Bolivia has granted to eight private oil companies during the last 2 years. It is north of the Camiri area which is controlled by Yacimientos Fiscales Bolivanos.

Shell Top Refiner

in Venezuela during June with runs of 303,300 bbl.

VENEZUELA'S second ranking crude producer was its top refiner in June.

Cia. Shell de Venezuela processed 303,300 bbl. daily at its Punta Cardon and San Lorenzo refineries. This was 46% of its total crude production. It exceeded runs to stills at Amuay and Caripito refineries by Creole Petroleum Corp., the leading crude producer.

Total Venezuelan refinery runs in June averaged 722,400 bbl. daily. This was 28% of crude production. Venezuela's oil law requires at least 15% of production be refined locally. Individual companies and their refinery runs were:

Operator—	Crude refined June 1958 (M. bbl. daily)
Cia. Shell	303.3
Creole	266.9
Venezuela Gulf	59.6
Richmond	50.4
Sinclair	21.0
Socony	9.2
Phillips	5.7
The Texas Co.	4.5
Petroquimica	1.2
Colon (Shell)	0.6
Total	722.4

Refinery Pact Is Signed

THE FINAL contract for operating the 30,000-bbl. refinery near Athens has been signed by the Greek Government and Oil Transport & Refining Co.

Formal approval of the agreement is expected to be granted next month by the Chamber of Deputies. Owners of Oil Transport won the contract in competitive bidding earlier this year. They are Socony Mobil Oil Co., Inc., Stavros Niarchos, a tanker magnet, and Bodosakis Athanassiades, a local financier (OGJ, Feb. 3, p. 74). Actual plant management will be in the hands of Hydrocarbon Research, Inc.

Socony Mobil will supply crude and export products the local market cannot absorb. The government, however, has the right to supply 30% of the crude from any source it chooses. There also are provisions to make room for domestic crude.

Maruzen-Union Pact Signed

A 10-YEAR contract for the exchange of oil has been signed between Maruzen Oil Co. and Union Oil Co.

The Japanese refiner will swap unfinished gasoline for crude and products. Included in the deal is bonded ships lubricating and fuel oil, which Union will supply to Japanese vessels calling at the United States West Coast and Hawaii.

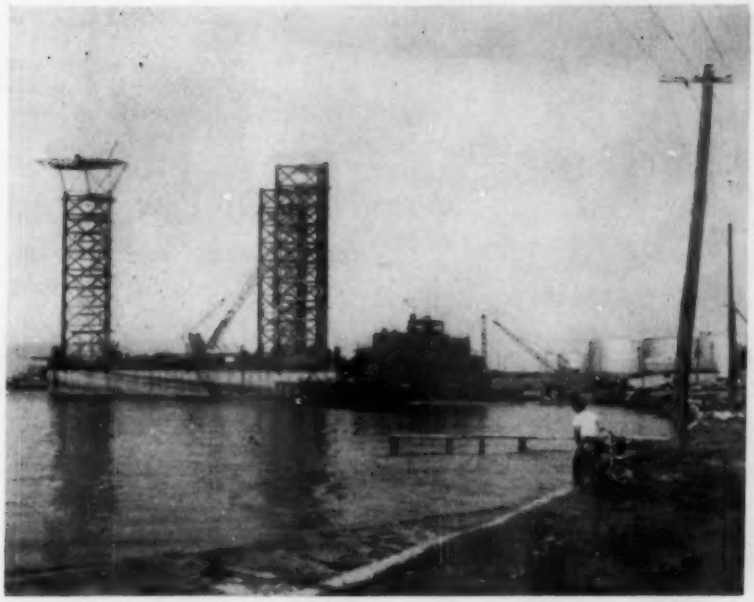
The new contract is in addition to a 7-month extension to an existing agreement. By next March, Union will have shipped 2½ million barrels of crude to Japan in trade for $4-million worth of products.

WORLD

The first field in Eastern Venezuela brought in by Creole Petroleum Corp. has completed 30 years of uninterrupted production. Quiriquire 1 was completed June 1, 1928, after $16 million exploration investment in that part of the country. The discovery well has produced 656,747 bbl. Cumulative field production is more than half billion barrels from 640 wells.

A $9-million, 6,400-bbl. refinery will be built north of Amman, Jordan. Jordan Oil Refinery Co. will take feed for the plant through a 30-mile spur from Trans-Arabian Pipe Line which carries Saudi Arabian crude to the Mediterranean. The new company has awarded the construction contract to an Italian firm, Soc. Nazionale Metanodotti.

A second Indian refinery may be built with financial and technical aid from Communist countries. Russia offered to build a plant in the 40,000-bbl. class at Barauni in Bihar state. India is now forming up an agreement with Romania for a 10,000-



Japanese Betting on Platform

A NEW mobile drilling platform is being counted on to triple Japan's crude production.

A three-legged LeTourneau barge is being fitted out after launching this month at a Japanese shipyard. Petroleum Resources Development Co. is erecting the 2,750-ton unit, at a cost of $1,670,000.

The company, jointly owned by the Japanese Government and Teikoku Oil Co., will move the platform to a site on the Michigawa coast in Akita Prefecture, off the West Coast of Japan. Drilling is scheduled to start October 5.

The Japanese are betting the barge can develop at least 14,000 bbl. daily of new production. With a present output of 7,000 bbl. daily, the new production would boost Japan's daily production to 21,000 bbl.

The company expects to take the first well to 4,500 ft. by mid-November, when winter usually sets in. Drilling will resume next April. Next year, the company hopes to complete the first well plus five others.

The barge will drill on at least four promising structures located 2 years ago in a Geophysical Services, Inc., survey. The structures extend for 36 miles from Tsuchizaki to Hirasawa. Tsuchizaki is close to Japan's best field, Yabase, which accounts for nearly half of local production.

The structures lie about 2½ miles offshore. They appear to be Tertiary beds similar to Yabase. The company plans to drill 100 wells along the coast, spaced from 1,500 to 3,000 ft. apart. Pay is expected at 6,000 ft.

Fishermen in the area are putting up a fuss. They are demanding payment of $280,000 compensation for interference with fishing, which they say will be impaired by pollution.

BRIEFS . . .

bbl. to 15,000-bbl. plant at Gauhati (OGJ, Sept. 15, p. 121).

Production from Ente Nazionale Idocarburi's field in Sicily will probably rise to 60,000 bbl. daily in time, according to Enrico Mattei, president of the Italian state agency. Gela field this year is expected to average 12,000 bbl. daily. ENI also has brought in a gas well in western Sicily near Castelvetrano, with a flow of about 1.5 million cubic feet daily.

Tankers moving through the Suez Canal started paying a 3% surcharge last week. The charge is being levied on all ships to pay for the cost of clearing the waterway after it was closed late in 1956. The extra payment will last about 3 years.

The entire output of a new 10,000-bbl. Albanian refinery may go to a Russian submarine base at Valona on the Adriatic Sea.

Russian technicians have already placed the plant at Cerrik on stream. Reports from Albania indicate a products line will be built to facilitate movement of products to the naval base. The plant is designed to handle crude from local Patos field. But domestic production is limited to about 6,500 bbl. daily, indicating the refinery will handle some imports from the Black Sea.

Peru is opening offshore areas to competitive bidding this week (September 22). For 2 months competition will be limited to Peruvians, after which it will be thrown open to foreign companies. Areas not covered by applications will become part of the national reserve.

A wildcat drilled by a Romanian crew in the Cambay region of India's Bombay State has had an oil show at 5,368 ft. The government says the well is drilling ahead to a projected 10,000 ft.

Eastern Venezuela's Merey field crude has been listed in company price postings.

Mene Grande Oil Co. posted $2.09 per barrel for 16° to 16.4° gravity f.o.b. Puerto la Cruz, with a price differential of ¼ cent per barrel for each 0.5 change in gravity. Cia. Shell de Venezuela lists a flat $2.13 per barrel for 17°-gravity oil, with no escalation.

A 14,000-ton per year carbon-black plant will be built at Ravenna, Italy, by Soc. Cabot Italiana, an affiliate of Cabot Laboratories, Boston. The $3-million project will take about 2 years.

Pemex will recognize maverick union leaders if they are elected in a special union poll later this month, The new leaders, recognized after rioting and a threat of a nation-wide strike, are reputed to oppose the present Mexican Government.

A West German company is shipping two rigs to Spain for tests on acreage held by Petrolifera Iberica.

Deutsche Schachtbau-und Tiefbohrgesellschaft, G.m.b.H., has acquired an interest in the local company which has a number of concessions in the Bilbao, Vitoria, and Pamplona areas. Gas and oil shows have been found in several stratigraphic tests. One of the rigs is rated to 2,500 ft., and the other to 5,000 ft. They will test structures where shows have already been located.

Pakistan Receives Refinery Report

THE PAKISTAN Government has received the final report for its proposed West Pakistan refinery.

The report was prepared by the consortium of four oil companies the government asked to submit proposals for setting up a refinery. The consortium earlier picked Keamari Groyne in Karachi as the site for the proposed refinery, and the government approved.

M. J. Condon, general manager of Burmah Oil Co. (Pakistan Trading), Ltd., presented the final project report to S. Osman Ali, secretary of the Ministry of Commerce and Industries. Present were J. W. Smith, general manager of S.V.O.C., and L. W. Butt, manager of Caltex Oil (Pakistan), Ltd., and S. S. Jafri, joint secretary of the ministry of industries.

The report recommends a 30,000-bbl. daily refinery. Cost is estimated at about $32 million.

More Rigs Slated for Aguasay

SUCCESS on neighboring acreage has prompted Sinclair Venezuelan Oil Co. to ask for bids on three more rigs for drilling in the Aguasay area of Eastern Venezuela.

The rigs will double the number of outfits Sinclair is using to develop acreage on new and extensive deep production in the greater Oficina area. The company is stepping up its program as a result of promising developments in Zulus field and in the ZM 501 area to the west held by Mene Grande Oil Co.

Details of Mene Grande's work have not been divulged. But the trends extend into Sinclair's concession.

Sinclair itself sparked a flurry of drilling activity in the area 2 years ago with a discovery in Aguasay 3. The well found more than 200 ft. of productive sands in a 14,221-ft. hole. One zone tested 689 bbl. daily of 35°-gravity crude. Another zone had equally good results.

A 5-mile stepout to the west, Aguasay 4, was later completed for better than 1,600 bbl. daily. Five miles further west, Mene Grande's Zulus 1 proved to be in the same class. Another indication of the extent of the new trend was Caro 1, an offset drilled by an Atlantic Pancoastal combine (OGJ, April 29, 1957, p. 120).

Plans Rosal pipeline . . . In another Eastern Venezuelan move, Sinclair plans to link its fresh find in Anzoategui province to the Travieso-Puerto La Cruz crude pipeline.

The company will lay a connecting line to the system from Rosal 1, brought in this year 7 miles north of Santa Rosa field. The well tested a total of 1,231 bbl. daily from two zones topped at 12,013 ft. (OGJ, May 12, p. 98).

The company has reached 13,517 ft. in Rosal 2, about 3,000 ft. west of the discovery. The wells are located in the northeast corner of a 24,000-acre block. Mene Grande is at 12,894 ft. in RM 201, an outpost well to the Rosal discovery. It is the operator on adjacent acreage held jointly with Creole Petroleum Corp.

New Oil Law Slated

for Spain by end of year. Proposal has 50-50 split.

THERE IS a growing confidence that the Spanish Government will pass a new oil law by the end of the year.

Reports from Madrid indicate legislation is already in shape, except for some of the finer points. Growing pressure on the Spanish economy will be the main reason for the action after years of delay. Spain is now spending 72% of its foreign-exchange earnings for oil imports.

The proposed law will be based on the standard 50-50 profit split. Licenses will be issued for 6 years, and in case of discovery, half the acreage on a permit will revert to the government. Exploitation rights are expected to run for 40 years, with a 10-year option.

One point remaining to be settled is whether companies will have the right to select the 50% of acreage they wish to keep in case of discovery in Rio de Oro (Spanish Sahara) or Spanish Guinea.

The Spanish think these areas offer better prospects. In case of discovery they planned to divide a license down the middle and require the company to take one half or the other. This point may be changed to allow companies wider leeway in selecting acreage under the conventional method.

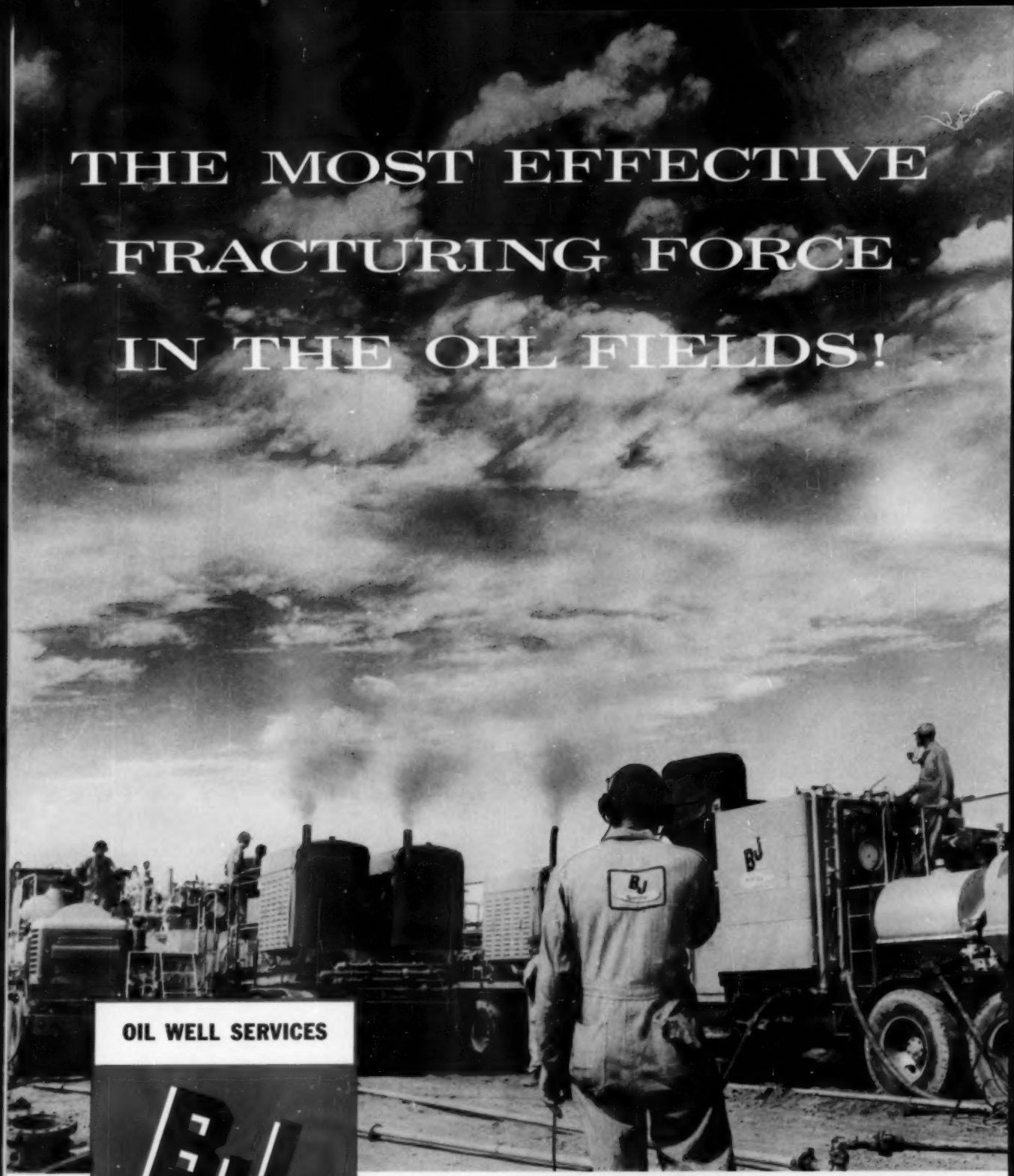
Venezuelan Stepout Slated

A STEPOUT from Venezuela's deepest producer is planned by Richmond Exploration Co. (Standard of California).

A well to be drilled southwest of Richmond's 36-E-2 is projected to 16,000 ft. The site is in a remote part of Western Zulia, over 30 miles southwest of Boscan field.

The 36-E-2 has probably established the country's deepest commercial production. Earlier this year, it initially flowed at the rate of 3,290-bbl. daily on a ¾-in. choke. It later tested slightly less than 1,900 bbl. daily. The 31°-gravity crude came from a cretaceous horizon below 15,600 ft. (OGJ, June 23, p. 89).

The 36-E-2 is 30 miles southwest of Boscan, and 24 miles west of the western shore of Lake Maracaibo.



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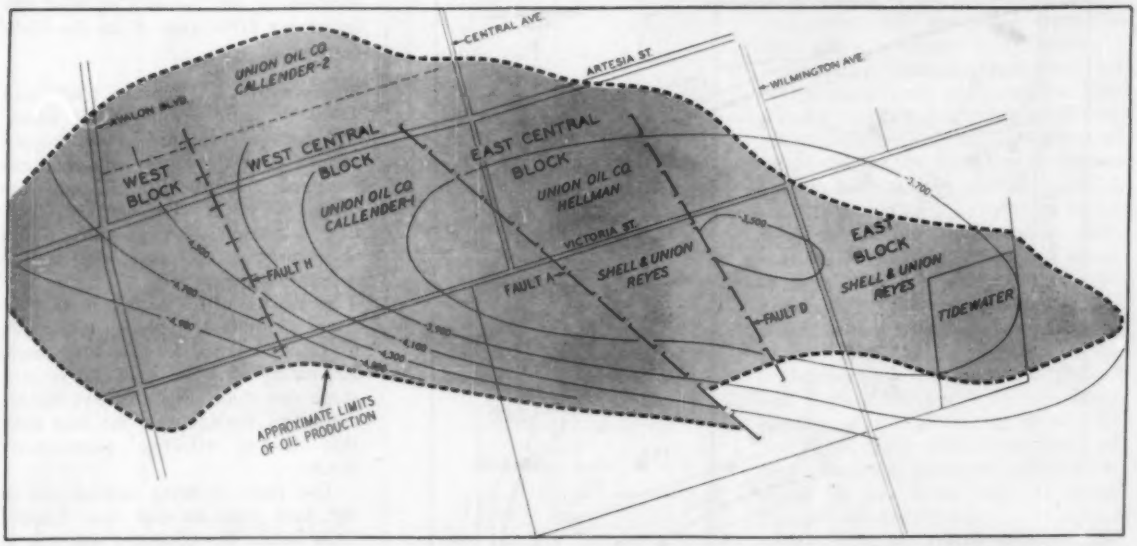


FAULTS in Dominguez field divide the first zone into separate reservoirs. East Central block is being flooded. Fig. 1.

Cooperative water flood pays off

Economics at Dominguez:

Total development costs, 1,500,000 dollars
Additional oil to March, 1958, 1,500,000 barrels
= quick payout

D. H. STORMONT
District Editor

A COOPERATIVE PROJECT of Union Oil Co. of California, Dominguez Oil Fields Co., and Shell Oil Co. in a 125-acre pool in Dominguez oil field is proving that water flooding will work in the thick, dirty sands which characterize many California oil reservoirs.

Started in July 1954, the flood resulted in the pool's daily oil output climbing from about 750 bbl. to a peak of almost 3,000 bbl. during May 1956. Since then oil production has declined steadily at about 23% per year to a rate of 1,484 bbl. daily in May 1958.

As of March 1, it was estimated the project had produced 1,500,000 bbl. more oil than would have been produced had the flood not been started. Cumulative oil production since the start of the flood had reached 2,459,000 bbl. at the close of May.

As of June 1, about 14,160,000 bbl. of waste water had been injected through 17 injection wells in an irregular five-spot pattern. Injection rates up to 12,500 bbl. daily were used during the reservoir fill-up period. Since then, and particularly during the last 14 months, input has been held just under the designed 10,000-bbl. a day mark.

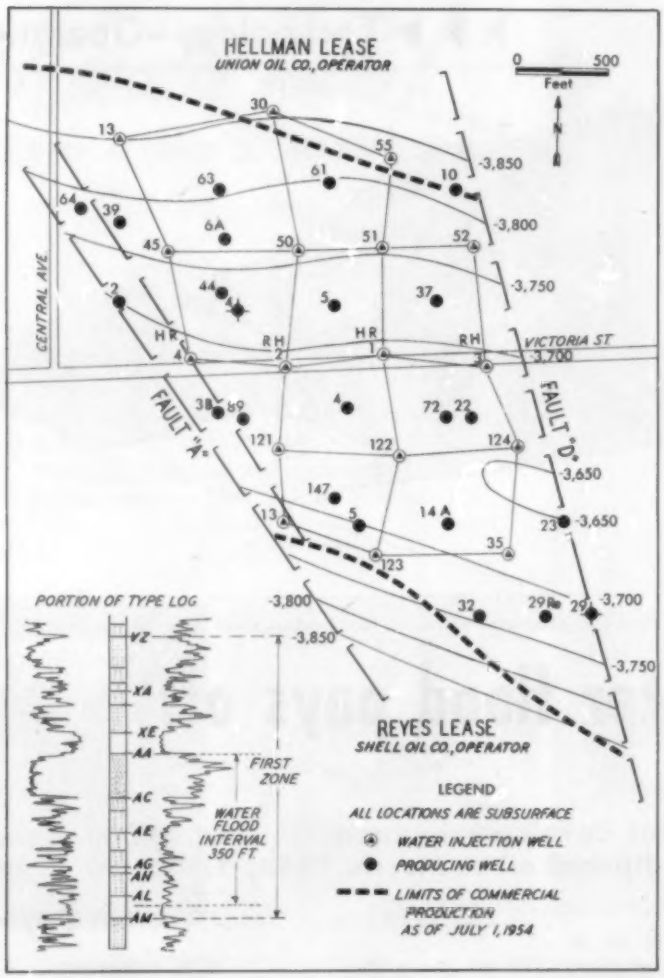
TABLE 1—CHARACTERISTICS OF SANDS AND FLUIDS IN POOL BEING WATER FLOODED

Sand thickness, ft.	200
Area bounded by edge water and faults, acres	125
Permeability, md.	250
Porosity, per cent	28
Connate water saturation, per cent	30
Oil saturation at start of flood, per cent	*41
Gas saturation at start of flood, per cent	*29
Residual oil saturation, per cent	†18
Original formation volume factor	1.20
Form. volume factor at start of flood	1.04
Original reservoir pressure, psi.	1,750
Reservoir pressure at start of flood, psi.	50-300
Reservoir temperature, °F.	155
Oil gravity, °API	30
Gas-free oil vis. at reservoir temp., cp.	3.5
Water vis. at reservoir temp., cp.	0.5

*Calculated on basis of no edge-water encroachment into reservoir. Some water inflow probably occurred so actual oil saturation may have been slightly higher and the gas saturation lower, especially at the crest of the structure. †Basis of flood pot tests.

Cooperative project . . . A unique feature of the project, the first full-scale flood started in California, is that it is a cooperative venture. Union and Shell as operators are independently flooding adjacent leases, with a pool engineering committee setting the amount of water going to the injection wells on each property. To protect against migration of oil across the lease line, four input wells were used to build up a water barrier.

The two leases involved are the Reyes and Hellman, with Shell hold-



EAST CENTRAL BLOCK, showing contours on the first zone and locations of producing and injection wells. Fig. 2.

TABLE 2—PERFORMANCE OF INJECTION WELLS DATA AS OF JUNE 1, 1958

Well—	Avg. rate B/D for May		Avg. May press. psig.	Cumulative barrels	
	Recom.	Actual		Recom.	Actual
13 Hellman	850	819	1,000	1,202,110	1,180,023
30 Hellman	650	702	1,000	1,128,260	1,019,423
45 Hellman	450	504	600	1,150,260	1,143,526
50 Hellman	700	775	1,320	973,930	927,195
51 Hellman	700	789	640	1,058,050	1,032,140
52 Hellman	325	358	Vac.	501,350	550,545
55 Hellman	350	422	800	616,310	605,680
1 Hellman-Reyes	700	673	565	1,010,590	991,134
4 Hellman-Reyes	450	472	400	666,080	661,617
Subtotal	5,175	5,514	....	8,306,880	8,111,283
2 Reyes-Hellman	700	713	30	1,010,590	999,012
3 Reyes-Hellman	490	521	440	661,640	652,507
13 Reyes	230	198	85	310,090	321,558
35 Reyes	500	645	240	765,150	765,919
121 Reyes	550	603	175	916,090	908,844
122 Reyes	650	780	280	968,980	987,044
123 Reyes	300	304	Vac.	681,540	576,355
124 Reyes	500	480	430	847,790	841,325
Subtotal	3,920	4,244	....	6,161,870	6,052,564
Total	9,095	9,758	....	14,468,750	14,163,847

ing a 50% interest in the Reyes lease. Union and its nonoperating partner, Dominguez Oil Fields Co., hold the remaining 50% and all of the Hellman lease.

Stratigraphy . . . Between 3,600 and 8,000 ft. there are eight oil zones. The bottom three are in the Puente formation of the upper Miocene, and the upper five are in the Repetto formation of lower Pliocene. The structure is complicated by both normal and thrust faults, especially in the deeper horizons.

At the top of the section is the first zone, about 600 ft. thick. It consists of fine-to-coarse, loose-to-firm sand, alternating with beds of sandy siltstone and shale. Fig. 1 shows the locations of the faults in the first zone that form effective permeability blocks.

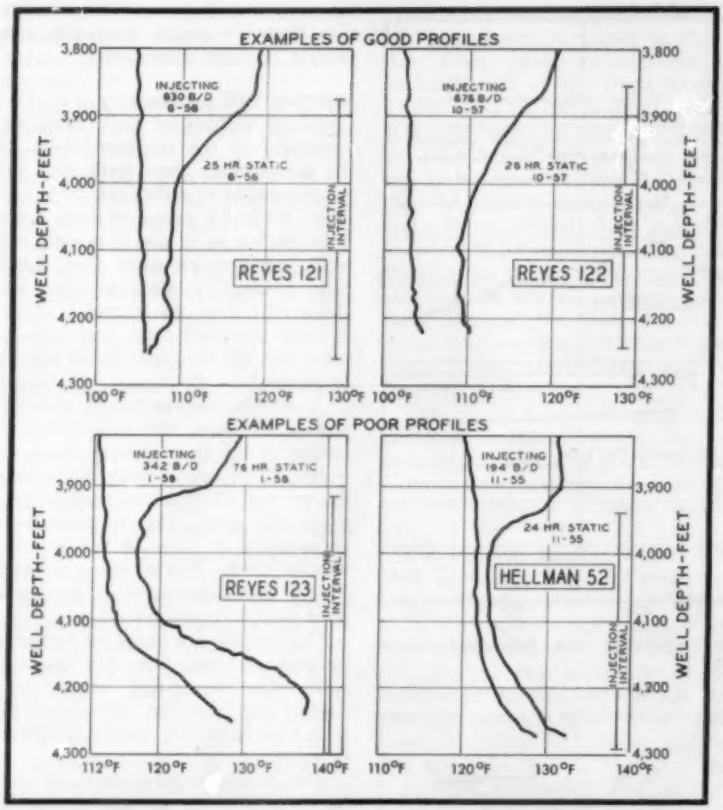
The flood is being carried out in the first zone in the East Central fault block. No pilot test was run in this block, since results of earlier floods in deeper zones indicated that favorable results could be expected. The lower 350 ft. of the first zone, or about 200 ft. of net sand, is exposed to flood water. Characteristics of the sands and fluids in this reservoir are given in Table 1, and Fig. 2 shows the type log and the flood-plan layout.

Performance of the flood to date, and data from other first-zone producers in adjacent fault blocks, indicates the effectiveness of the faults as permeability barriers. It was originally thought that the faults might permit migration of the fluids from one block to another, hence the adoption of a five-spot plan in favor of a flank line drive. All evidence points to the fact that the effects of the flood are being confined to the EC-1 (East Central—first zone) pool.

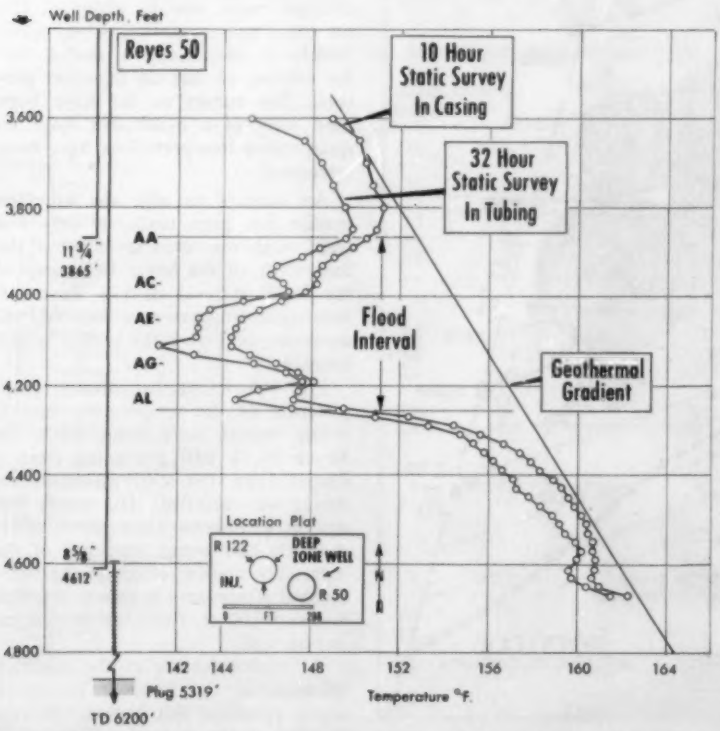
On the north and south flanks oil production is limited by edgewater. Formational dip is from 0° to 15° with the south flank being the steeper. Crest of the structure is a short distance south of Victoria Street, boundary between the two leases.

Primary recovery . . . The first well in the EC-1 pool was completed in 1924 and most wells were completed during the next few years. An interspacing program in the early forties added several additional wells. Because of the few operators involved and the relatively large size of leases, development was carried out along much more systematic lines than in other California fields during this era.

The pool history includes an effort to increase recovery by gas injection. Between the years 1926-1936



TEMPERATURE SURVEYS used to obtain injection profiles. Examples of good and bad profiles are shown. Fig. 3.



TEMPERATURE SURVEYS in 50 Reyes, producing from a deeper zone, shows effect of injection in a well about 100 ft. away. Fig. 4.

almost 8,000,000 M.c.f. was injected into nine wells in the EC-1 pool.

By July 1, 1954, cumulative recovery from wells producing from the first zone or from other zones in combination with the first zone (of which there were many in the East Central block) had amounted to about 26,200,000 bbl. of oil. Of this total about 14,500,000 bbl. was estimated to have been recovered from the EC-1 interval, based on an allocation which proportioned the production in relation to the amount of interval open. If true, then a primary recovery of about 32% of the estimated 45,000,000 bbl. of stock-tank oil originally in place is indicated.

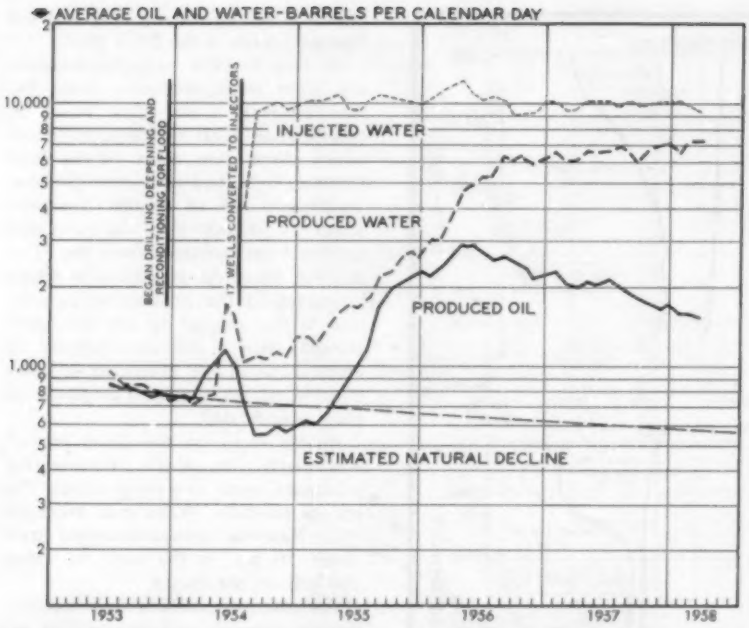
Before work on the flood project was started, the pool's 29 remaining producers were averaging about 750 bbl. of oil daily. Water cuts averaged 66%. Reservoir pressures ranged from about 50 psi. in the crest to about 300 psi. on the flanks.

An extensive drilling and reconditioning program was required to get the zone ready for the flood. Seven new wells were drilled, 9 were worked over, and 10 were plugged. Of the new wells, four were injection wells on the common boundary line (Victoria Street) between the two leases.

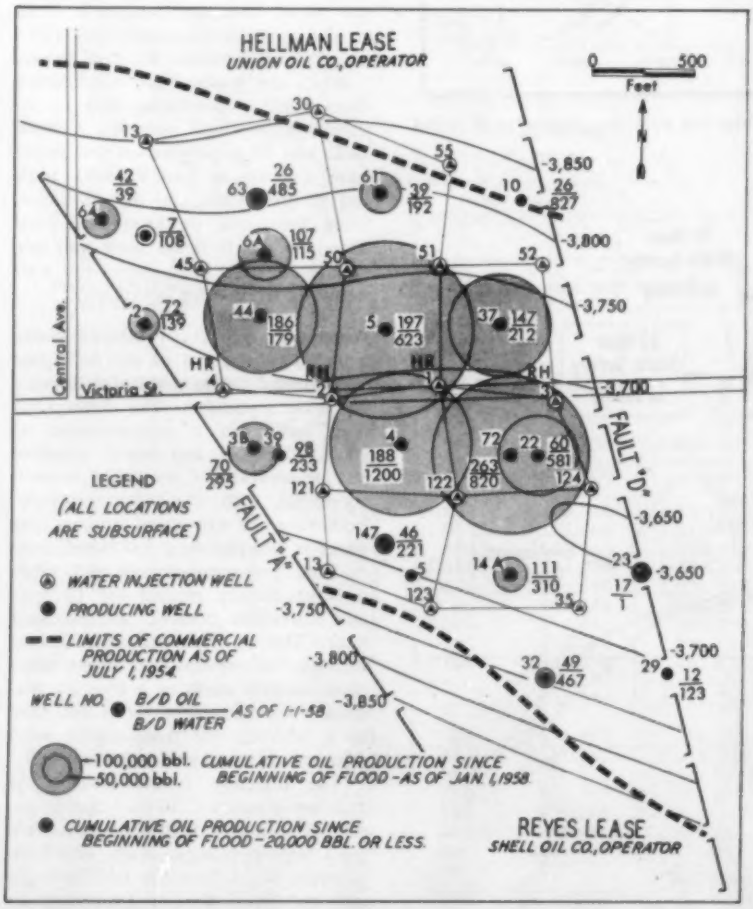
When the water flood was started there were 19 producing and 17 injection wells. Shell operated 8 input wells and 10 producers on the Reyes lease and Union had 9 input wells and 9 producers on the Hellman. Since then one producer has been added on the Hellman lease and one on the Reyes. Fig. 2 shows the well status under present operations.

Water supply . . . Produced water from all eight zones of the field goes to a common skim pond after leaving the lease separators. The water contains iodine in a concentration of about 70 p.p.m. and this is removed by Deep Water Chemical Co. (not connected with the oil operations). Following the extraction process, the water is pumped to a 5,000-bbl. gunite-lined raw-water-storage pit. Here it is chemically treated for bacteria and corrosion control, as discussed later. This is followed by filtering through two pressure-leaf filters, using diatomaceous earth as a filtering medium. The filtered water is collected in a 600-bbl. pit from which it is pumped to the injection wells.

The injection system consists of two low-pressure (250-psi.) centrifugal pumps and five high-pressure (2,000 psi.) triplex pumps. High and low-pressure main lines are laid throughout the flood area and connections can be made to either system according to the pressure required to inject



PRODUCTION HISTORY of the EC-1 flood in Dominguez field. Estimated natural decline is indicated for comparison. Fig. 5.



CUMULATIVE PRODUCTION from wells near the crest of the structure is greater than from those wells on the flanks. Fig. 6.

the recommended rate. The distribution lines are coated internally with cement to resist corrosion.

Injection well performance . . . Few operating difficulties have been encountered in the injection wells. In the initial phase most wells took the recommended injection rate at a vacuum. Wellhead pressures have since built up, but as of last May only two wells required pressures over 1,000 psig. Average wellhead pressure was about 570 psig. As shown in Table 2, both operators have been able to carry out the five-spot flood pattern as planned.

. . . Profile surveys run on all injection wells show the entire vertical section of the flood zone is being invaded. Some wells appear better than others, but all injection profiles generally are good. This is particularly encouraging in view of the approximately 350-ft. interval being flooded. Fig. 3 shows examples of good and poor injection profiles.

The profiles are based on two temperature surveys. One was recorded while water was being injected at a normal rate and the other after the well had been shut in for 24 hours or more.

The static temperature curve may be influenced to a great degree by the cumulative injection. Therefore it may not necessarily represent the instantaneous injection profile if profile changes occur due to plugging, fill-up, etc. The temperature survey nonetheless is considered a useful tool for routine checks on injection profiles. The curves so far have been used only in a qualitative way; no quantitative interpretations have been attempted.

An attempt to alter the injection profile has been made in only one well. Acid was used to improve the receptivity of the lower two-thirds of the flood interval in 123 Reyes. A substantial improvement resulted, but as shown in Fig. 3 the profile is still inferior.

Fig. 4 shows another interesting application of the temperature survey. While repairs were being made on Reyes 50, a well producing from a deeper zone, the temperature in the tubing was recorded. The survey was run in a gaseous atmosphere, while the rods and pump were out of the hole. The cooling effect in the flood interval is apparent in this well which is about 100 ft. from the nearest injection well.

A notable feature of the injection behavior of the flood is its unbalanced potential distribution. Average injection pressure at the midpoint of the flood interval is approximately

2,200 psi. The observed formation pressure (from buildup tests in producers) is in the range of 400 to 600 psi.

The indicated pressure drop between injection and formation pressures is 1,700 psi. This is over three times the 500-psi. drop between formation pressure and producing-well pressure. The unbalance is believed to be partly due to differences in mobility of the water bank and oil bank, and partly due to skin effects being higher in the injection wells than in the producing wells.

Flood performance . . . How the pool has responded to water flooding is shown in Fig. 5. Initially, oil production dropped from about 750 bbl. to 550 bbl. daily, due to producers being converted to injection duty. Little response was felt until in mid-April 1955, almost 9 months after the flood was started.

By the end of 1955 oil output reached 2,300 bbl. daily, and in May 1956 it peaked at almost 3,000 bbl. per day. Oil production might have gone higher but at that point the water-injection rate was cut from 12,500 to 10,500 bbl. daily in an effort to balance input and withdrawals from key five-spots. Production has trended downward since then, averaging 1,484 bbl. daily during May 1958.

Greatest production increases have occurred in the five-spot at the crest of the structure as shown in Fig. 6. The crestal producers accounted for essentially all of the flood response at the close of 1957. Their production rates were up almost sixfold at the flood's peak, but are now declining, as indicated in Table 3. This decline is partially being made up by increases at several flank producers as a result of workover operations. Wells close to the fault zones have shown essentially no increase, apparently because the fault zones are broad, and contain numerous branch faults. Also, permeability may be impaired in these zones.

One of the most successful remedial jobs carried out was by Shell at 14A Reyes. This well failed to show a production response even though the static pressure increased materially.

The well was pressure washed with 28% mud acid and the perforated interval was casing swabbed in March 1956. Production since acidizing has been about 100 bbl. per day and 350 bbl. per day water. This is an increase of 80 bbl. per day oil and 310 bbl. per day water. Five other flood producers have been acidized with good results.

Another outstanding job was the recent redrill of 29 Reyes. The well was directionally redrilled away from the fault zone and completed for 150 bbl. per day oil, 300 bbl. per day water. This compares with 10 bbl. per day oil and 125 bbl. per day water prior to redrilling.

. . . Gas production has steadily decreased since the start of the flood. In July 1954, total output was 300 M.c.f. daily. During July 1957 it was down to about 125 M.c.f. The pool average gas-oil ratio also has shown a marked decrease as the flood progressed, dropping from 520 to 70 cu. ft. per barrel. Gravity of the produced oil, however, has increased about 2° API.

Operating problems . . . Control of sand has been the biggest problem connected with the project but this problem is not acute. Water supply also sometimes has interfered with operations. Some trouble has been caused by algae, corrosion, and scale, but these problems are under control now.

. . . Sand troubles for the most part have centered around liner failures and frequent pump replacement. Indirectly, through requiring that high fluid levels be maintained, sand is resulting in curtailed oil output at some producers.

Sand likewise is acting to curb water injection. When injecting at high rates, the high fluid velocities resulted in more sand being moved toward the well bores. There are favorable exceptions, however. At 4 Reyes, gross production is about 1,400 bbl. per

TABLE 3—INDIVIDUAL WELL-PRODUCTION RESPONSES

	Prod. prior to response, B/D		Prod. December 1955, B/D		Prod. December 1956, B/D		Prod. May 1958, B/D	
	Oil	Water	Oil	Water	Oil	Water	Oil	Water
Crestal five-spot:								
5 Hellman	31	7	616	144	313	407	168	674
37 Hellman	12	3	219	41	221	144	142	384
44 Hellman	13	11	....	....	263	96	102	166
4 Reyes	89	13	276	209	272	840	121	1,161
22 Reyes	45	1	168	62	99	431	51	588
72 Reyes	14	7	275	75	415	488	176	937
Flank five-spot:								
6A Hellman	33	11	101	125	104	108	71	196
61 Hellman	10	19	149	143	68	166	40	94
63 Hellman	25	60	34	138	42	323	26	412
5 Reyes	14	17	....	....	....	....	15	331
14A Reyes	25	7	9	5	80	330	106	755
147 Reyes	35	130	15	589	24	261	25	146
Crestal, outside pattern:								
2 Hellman	6	20	44	47	55	70	45	123
38 Reyes	72	9	83	249	87	283	65	457
89 Reyes	....	....	....	....	23	130	53	320
Flank, outside pattern:								
10 Hellman	1	17	0	257	21	615	25	806
39 Hellman	....	....	....	....	82	983	4	108
64 Hellman	50	65	....	....	38	33	33	30
23 Reyes	27	10	22	3	9	4	22	2
29 Reyes*	20	149	14	134	10	116	161	319
32 Reyes	25	582	20	659	17	589	33	403
Total	547	1,138	2,045	2,880	2,243	6,417	1,484	8,412

Cumulative oil production since July 1, 1954, 2,458,909 bbl.
*Directionally redrilled away from fault zone during March 1958 and completed for 150 bbl. per day oil, 300 water.

day and no sand trouble has been experienced. Gravel packs and fine-mesh lines have been used in some wells to control sand entry.

...Chemical treatment initially consisted of a quaternary ammonium chloride compound for bacterial and corrosion control. In 1955 treatment was changed after the system became infected with sulfate-reducing bacteria, as a result of using water which had not passed through the iodine plant. To assist in bacterial control, 8 p.p.m. of a chlorinated phenol were added.

As the flood progressed, scale began to be a problem in producing wells. This has been fairly well brought under control by downhole injections of an organic scale inhibitor.

Periodic shutdowns of the iodine plant, as a result of the sand filters becoming plugged, have caused numerous interruptions in injection activities. This problem has been eliminated, however. A 42,000-bbl.-capacity flotation cell for removal of residual oil was installed ahead of the iodine plant. Thus, whenever the extraction plant is shut down, water is run directly from the cell to the raw-water-storage pit.

...Other full-scale floods in Dominguez field may be started in the not-too-distant future. In addition to the EC-1 flood, Union is carrying out a full-scale flood of the third and fourth zones of the West Central block. These require about 7,000 bbl. per day injection water in addition to pilot projects being conducted in two other zones.

Economics . . . Development costs for the EC-1 flood totaled about $1,500,000 at the start of 1958. Of this amount almost $1,050,000 was for drilling and working over wells, $280,000 was for the water plant, and $170,000 for artificial-lift equipment.

The 1,500,000 bbl. of additional oil (based on excess over expected current primary production) which have been produced to March 1958 are more than sufficient to pay out the development cost and higher operating expenses. Regarding the latter, direct production costs have about doubled since the flood was started. Cost of treating and injecting the water has averaged less than 2 cents per barrel.

Acknowledgement . . . The author expresses appreciation to the management of Union Oil Co., Shell Oil Co., and Dominguez Oilfields Co. for permitting this information on California's first full-scale water flood to be published.

BOOKS

LANDMAN'S LEGAL HANDBOOK: A PRACTICAL GUIDE IN LEASING FOR OIL AND GAS. By the Denver legal staff of the Continental Oil Co. Published by F. H. Gower, 2240 Mile High Center, Denver 2. 200 pp. $4.50.

This book covers the procedures to be followed from the landman's first step in acquiring an oil and gas lease until the attorney has examined and accepted title for drilling.

It covers fee, federal, Indian, state and county leases and the examination of records pertinent to such leases.

The book suggests the proper form of legal instruments for leasing, federal unitization, and many other common situations, and includes forms to be used in curing title defects. There is a section on federal unitization.

Among the subjects covered are instruments affecting real property, oil and gas leases, examination of records, curative work, federal units, leases, curative instruments and such miscellaneous instruments as designation of depository, release of federal or Indian leases, and amendment of lease.

In addition, pocket supplements covering individual state laws affecting leasing for oil and gas are available for Colorado, Montana, Utah, and Wyoming.

THE PROPERTIES AND TESTING OF PLASTICS MATERIALS. By A. E. Lever and J. Rhys. Published by Chemical Publishing Co., Inc., 212 Fifth Avenue, New York 10. 197 pp. $4.75.

Dealing principally with the testing of plastics, this volume is intended as a source book or reference work for those engaged in that field. The authors explain, "Much of the literature concerned with this aspect of plastics is at present dispersed over a wide field and to assemble it in a useful form for ready reference is the prime object of this book. In it the practical rather than the theoretical features are given full emphasis."

The book consists of a series of short sections averaging about two pages each, dealing with different aspects of single chapter headings. For instance, the chapter on thermal properties contains sections (each individual section fully referenced, often with illustrations) dealing with low temperature, softening point, flammability, thermal conductivity, coefficient of expansion, heat resistance, mould shrinkage, linear and cubical expansion, and shrinkage and annealing.

In all, there are 78 separate articles, divided into seven chapters and four appendixes, as well as a glossary.

In appendix form is information about testing of finished mouldings, efficiency of plasticizers, standards organizations, and special tests and properties of industrial materials.

HOW TO BECOME A PROFESSIONAL ENGINEER. By John Constance. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36. 288 pp. $5.50.

Nearly half a million engineers still not licensed can benefit most from this just-published book; movements are now under way in most states to require all engineers to become licensed, the author points out. This is a clear, comprehensive guidebook for both these unlicensed engineers-in-practice and young engineers on how to obtain a professional engineer's license.

Constance lists and clarifies the seven basic requirements for licensure; summarizes in plain terms the various registration laws; and shows clear examples of how examining boards evaluate the experience of the candidate.

The book also explains how to prepare an application; gives pointers on selecting the qualifying experience and writing it up; shows how to prepare for written and oral examinations and how to avoid emotional stress during tests; points out what to look for—including pitfalls—in refresher courses; and tells how to achieve multiple-state registration.

The book is applicable in all states, showing what all boards aim for. There is a chapter on the engineer's seal and its use, and extensive appendixes lists names and addresses of state board secretaries, accredited schools, and recommended texts.

AUTOMATIC CONTROL PRINCIPLES AND PRACTICE. By Werner G. Holzbock. Reinhold Publishing Corp. 430 Park Avenue, New York 22. 258 pp. $7.50.

The author, chief engineer of Askania Regulator Co. is also author of the book "Instruments for Measurement and Control," published by Reinhold in 1955.

The new book on automatic control attempts to cover the control field without getting into differential equations. It appears to be a good introductory text for those not acquainted with automatic control principles and a good review for those who have already had some introduction to the subject.

Basic concepts, statistics and dynamics are covered in the first five chapters. Chapter 5 is a not-too-complicated approach to frequency response, one that will be welcomed by the practicing engineer who is not necessarily an instrument expert.

Next come several chapters on the hardware of control systems—pneumatic components such as flapper-nozzle, bellows, pilot valves; and electrical components such as potentiometers capacitors, oscillators, amplifiers, etc.

Measuring elements, controllers, and control valves are then dealt with. The last two chapters deal with control systems and industrial applications.

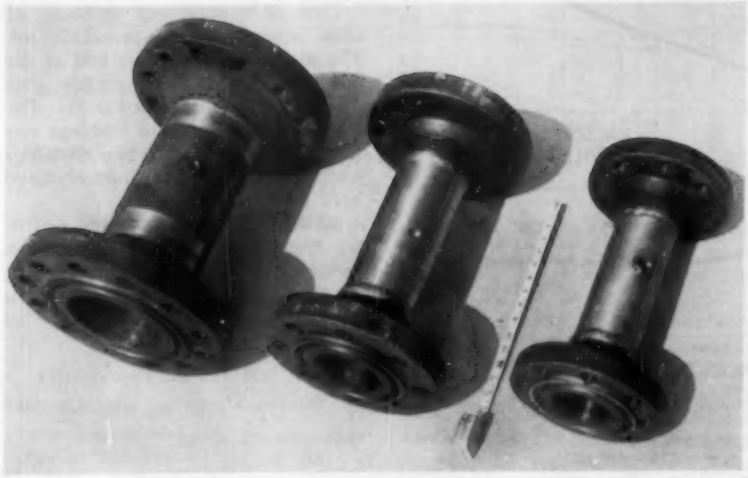
AUTOMATIC PROCESS CONTROL. By Donald P. Eckman. Published by John Wiley & Sons., Inc., 440 Fourth Avenue, New York 16. 368 pp. $9.

This book is written for all engineers who are concerned with instrumentation. It gives the important principles of automatic control and emphasizes block diagrams and frequency techniques in process control. It begins with process analysis and carries on with the generalized behavior of flow-loop systems. System problems are given a great deal of study.

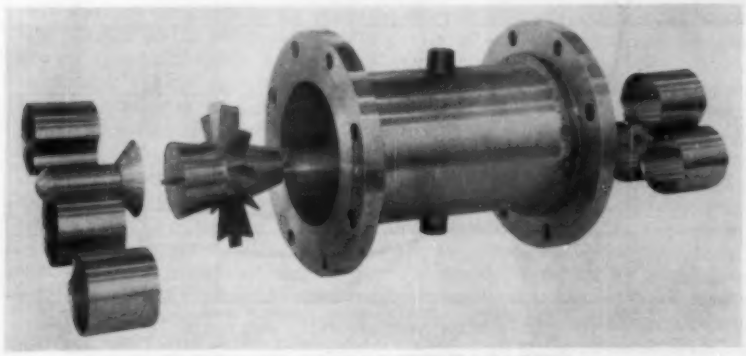
The techniques of analysis are fully used and enough detail is presented so that some of the most difficult problems may be inspected closely. A number of problems and answers are incorporated.

Special topics include: new electronic controllers, control elements and actuators, nonlinear elements encountered in process control, Nyquist and Bode diagrams, fluid and thermoprocess control, computer-optimizing control, and direct comparison of control action.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.



POTTERMETERS in 6, 3½, and 3-in. sizes. Fig. 1.



EXPLODED VIEW of 8-in. meter. Fig. 2.

New turbine-type meters for custody transfer

of crude petroleum and petroleum products

BY ARTHUR R. DUNLOP AND C. ALAN McCUTCHEON
Sun Pipe Line Co.

SINCE 1955, Sun Pipe Line Co.'s product lines department has been making tests on the turbine-type meter manufactured by Potter Aeronautical Co., of Union, N. J.

The manufacturer, in cooperation with the pipeline company, endeavored to develop a medium to high-capacity meter with sufficient accuracy to be used in the custody transfer of crude petroleum and petroleum products. As a result of these tests, Sun Pipe Line has now in products service for official billing purposes two 6-in. and one 3½-in. Pottermeters. Two additional 3½-in. and three 3-in. Pottermeters will be installed in 1958 replacing obsolete equipment.

Fig. 1 shows three sizes of meters used by Sun Pipe Line. The housings were fabricated and hydrostatically tested to 1,800 psi. by the pipeline company before the sensing elements were installed by the manufacturer.

Fig. 2 shows an exploded view of an 8-in. Pottermeter.

Originally, two 4½-in. Pottermeters were purchased for use with hydraulic-control equipment, and it was not proposed at that time to use the meters for accurate measurement. Early in 1955, one of these 4½-in. meters was installed at a booster station to be used chiefly in testing controls on pumping equipment.

An electronic counter was installed with the meter and records were kept of the quantities of different products through the 8-in. line. For several months comparisons were made between the Pottermeter registration and the record of the flow through positive-displacement meters 30 miles upstream. The results of these comparisons with the accuracy and consistency obtained pointed to the possibility of using the Pottermeter for accounting purposes.

Basic Testing

The 4½-in. Pottermeter having a nominal capacity of 2,300 bbl. per hour was the first meter of this type calibrated on petroleum products. Along with an electronic totalizer, the meter was installed in series with an existing battery of 3-in. displacement meters at the Newark end of Sun's 8-in. products line.

Here, by the master-meter method of proving, accuracy curves were obtained on the meter for both gasoline and domestic furnace oil. Between June 1955 and June 1956 much testing was done and several changes were made in the design of the rotors and bearings.

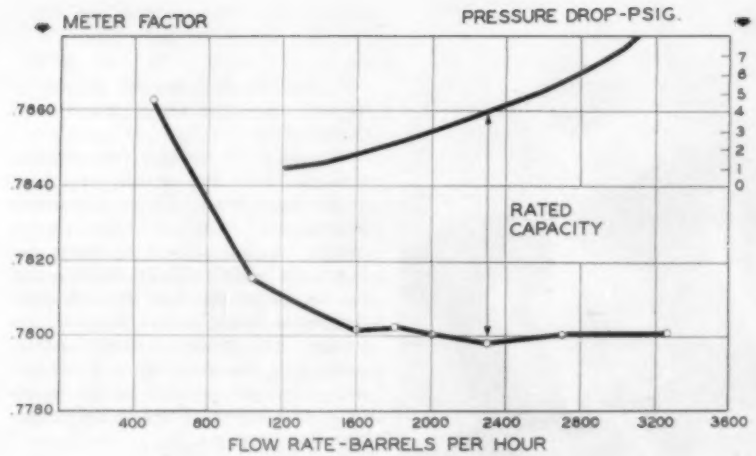
Fig. 3 shows the accuracy curve of the 4½-in. meter after the final changes were made. You will note that the diagram also shows head loss through the meter up to 40% above the rated capacity of the meter.

It was believed at this point that the Pottermeter would operate accurately at rates up to 150% of its rated capacity as indicated by the accuracy curve, and that the flow rate would be limited only by the amount of pressure loss that could be economically accepted. However, that assumption was found to be incorrect.

The two 4½-in. Pottermeters were installed in product service, and after running at a flow rate of 3,500 bbl. per hour for 30 hours, both meters failed. Excessive end thrust on the rotor shafts caused eccentric wear in the bushings and the eventual sweeping away from the housing of both the rotors and guides. One rotor was recovered in the suction of a centrifugal pump and the other was later taken from a storage tank during a cleaning operation.

Straightening Vanes

The 6-in. Pottermeters with a rated capacity of 4,500 bbl. per hour each were purchased early in 1957 and in-



ACCURACY CURVE of 4½-in. meter on gasoline. Fig. 3.

between April 1, 1957, and June 1, 1958, in a total of 25,000,000 bbl. of products.

Cost of maintenance on both of these meters has been practically nil. The meter at the Newark end of the line was removed for inspection after a throughput of 10,000,000 bbl. The wear on the pivots and bushings was found to be .003 in. New bushings were installed and the meter placed back in service.

The meter at the incoming end of the line has not been removed from service since first installed in January 1957 and as of June 1, 1958, has a throughput of 28,000,000 bbl. of products.

2-In and 3½-In. Pottermeters

Considerable testing was also done on the 3½-in. size Pottermeter (capacity, 1,430 bbl. per hour). Final design of this size produced an accuracy curve with a variation of less than .20% between 300 and 1,000 bbl. per hour, with less than .20% difference between gasoline and furnace oil.

Fig. 7 shows the curves of two 3½-in. meters recently installed in the 8-in. products line of Sun-Canadian Pipe Line Co., Ltd., at Toronto. One of these meters at Toronto is being used for custody transfer. Both are being used as a pair for control purposes in an application which will be described in a later article.

A 2-in. size Pottermeter (capacity, 350 bbl. per hour) was also tested directly into a prover tank on both gasoline and furnace oil. The curves obtained were unsatisfactory and there was a difference of 1% between gasoline and furnace oil. The manufacturer will do further development on this size meter.

Totalizers

During the early testing of the turbine meter, it was noticed that after

stalled in the newly constructed 14-in. products line between Marcus Hook, Pa., and Newark, N. J. One was placed at the suction side of the initial pump station at Marcus Hook, and the other at the delivery end of the line.

During the calibration of these meters it was determined that the configuration of the piping upstream had an effect on consistency of the value of the meter factor. It was concluded that some kind of straightening vanes were necessary for the efficient operation of the meter.

Facilities were not available to do any extensive research on the effect of different types of vanes, so a design was made adequate and probably more expansive than necessary.

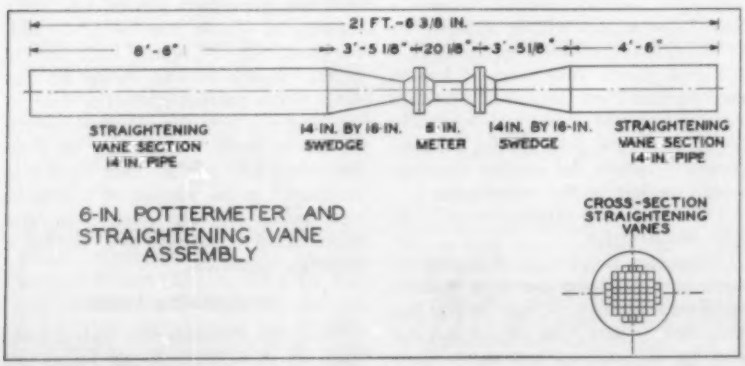
Fig. 4 shows the 6-in. meter and vane assembly as finally constructed.

One-Year Record of 6-In. Size in Custody-Transfer Service

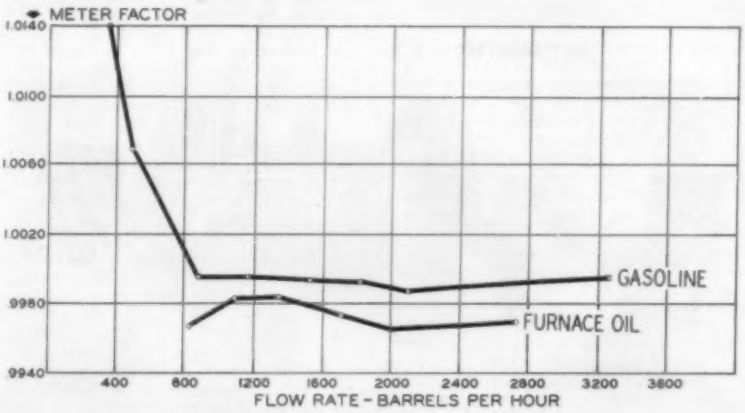
Fig. 5 shows the accuracy curves on one 6-in. Pottermeter on two products. As indicated, the variation on the gasoline curve was approximately .10% between 20% and 75% of the rated capacity of the meter. The head loss through the meter at 3,000 bbl. per hour was 2 psi. and 3 psi. including the entire assembly.

Fig. 6 shows the record of factor determinations for gasoline on the above 6-in. meter.

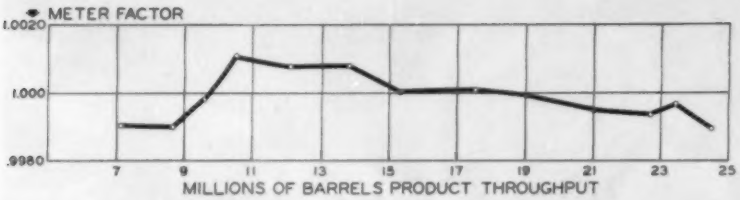
With one 6-in. Pottermeter at each end of Sun's 110 miles of 14-in. products line, as noted above, the records show that the variation between the runs and deliveries was less than .01%



STRAIGHTENING-VANE assembly and 6-in. meter. Fig. 4.



ACCURACY CURVES for 6-in. meter. Fig. 5.



FACTOR DETERMINATIONS for 6-in. meter at 2,400 bbl. per hour of gasoline. Fig. 6.

a certain period of time the meter appeared to be "slowing down." That is, meter factors began to increase between calibration checks and furthermore, the rate of increase was apparently increasing also.

Considerable investigation into the possibility of meter-bearing drag due to pipe scale and dirt, turbine unbalance due to deposits on the rotor, product temperature effects, etc., all indicated that the turbine meter was not affected by any of these factors.

It was not until one of the meters was returned to the manufacturer and a water-calibration check indicated no measurable change from the calibration check made at the time the meter was built led us to suspect the electronic totalizer. Actually, checks had been taken right along on the totalizers by actuating them with accurately known pulse rates such as power-line frequency. However, these checks were for short periods of time only, hardly ever more than a few minutes.

It was then decided to use two totalizers per meter and at the same time begin accelerated life tests in our laboratory on other totalizers. It was soon evident that herein lay the cause of the apparent meter "slowdowns." The continuous 24-hour per day duty on the totalizers was causing them to become intermittent, gradually at first but, as the total number of counts increased, the rate of "misses" also increased.

It was difficult to determine accurately the total number of counts registered before missing started, but on an average it appeared to be around 3 to 5 million counts. Investigation revealed that the failures were occurring in the readout section of the totalizers, namely, an a.c. solenoid-operated magnetic register, energized through contacts on a plate circuit relay in the output stage of the totalizer.

Both the magnetic registers and the driving relays were failing with about the same degree of reliability. By working with the manufacturer an improved totalizer was developed by Sun Pipe Line Co. using a six-digit precision register coupled to a miniature stepping motor (Sigma cyclonome). The motor is driven by a thyratron pulse network triggered by the same signal which formerly operated the output stage of the totalizer. Thus the relay and mechanical ratchet counter system was replaced by an all-electronic "magnetic ratchet" and reliability was greatly increased.

Fig. 8 is a photograph of the revised counter which is mounted in a case supplied by the manufacturer.

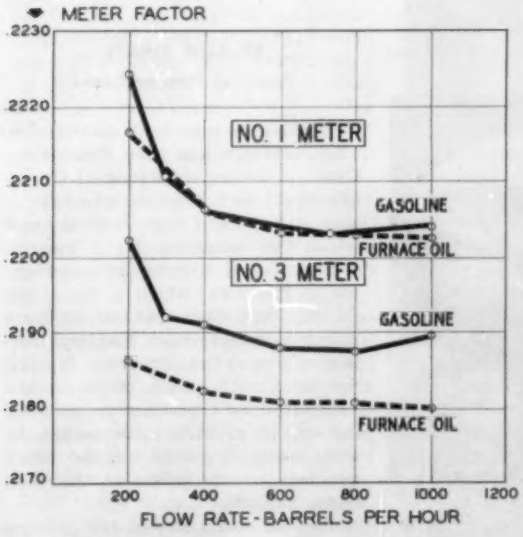
The manufacturer has also made significant changes in the relay-driven, solenoid-operated register and now offers a totalizer with greatly increased life expectancy. Sun Pipe Line Co. is testing a few of these totalizers.

Shielding

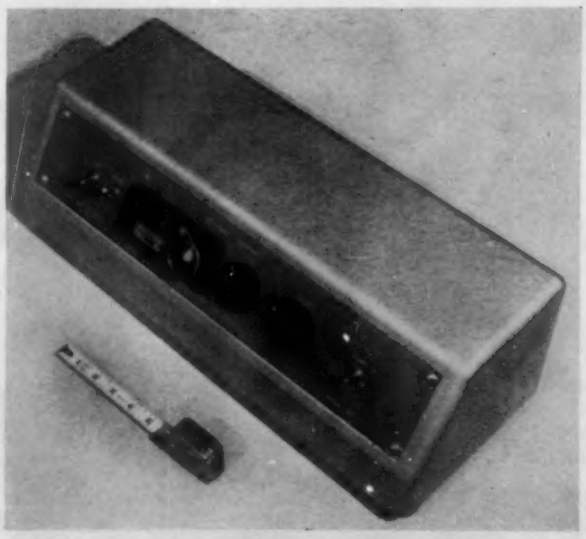
The importance of adequate shielding of the two-conductor cable, which connects the sensing-element output coil to the electronic totalizer input, was evidenced early in the testing. Due to the high-impedance nature of this section of the circuit, it was found that electromagnetic induction effects were noticeable (especially with long cable runs between meter and totalizer) when the totalizer sensitivity was increased to respond to low-output voltages prevalent at low flow rates.

Random discrepancies in line balance and continued counting of the totalizer after flow had ceased through the meter were some of the more noticeable effects of this stray pickup. It was found that by following three simple rules the troublesome pickup was eliminated. These are (1) use twisted-pair, shielded cable; (2) ground the shield at the totalizer end only and not at both ends; (3) always run cable in separate conduit, never in a conduit with other conductors.

It was also found that the pickup-coil output voltage can be transmitted directly over voice-grade telephone circuits for considerable distance, provided proper impedance matching transformers are used at both the sending and receiving ends. Vacuum-tube and transistor amplifiers have also been developed which can be used for greatly extending these distances and improving signal-to-noise ratio.



ACCURACY CURVES for 3½-in. meter. Fig. 7.



ELECTRONIC COUNTER used with turbine meter. Fig. 8.

ROCKS AND HILLS—as steep as 60°—were construction obstacles for Cherokee Pipe Line.

PIPELINES

Tough ditching slowed progress

through rocky Osage Hills on Cherokee project

DYNAMiTE is planted and connected with primacord for blasting a ditch through rock.

BY GENE KINNEY
Assistant Pipeline Editor

PIPELINERS who built an 84-mile, 12-in. products line from Ponca City, Okla., to Glennpool station of Cherokee Pipe Line Co. developed a healthy respect for the Osage Hills through which they struggled for 2 months.

They found surprisingly tough going in this area, which is the cradle of the Mid-Continent oil industry where men have been building pipelines for more than 50 years. Pipeline Service Co., Seminole, Okla., prime contractor for Cherokee, encountered one special problem after another on the Glennpool end of the line which connects two refineries in the West Tulsa industrial area.

But the worst day-to-day problem was in the Osage Hills which are

known for their rocky, timbered beauty, whose scenic qualities pipeliners had trouble appreciating. There were several 60° hills. Towing all equipment uphill became routine. There was the constant danger of runaway equipment, but no serious accidents occurred.

If any one thing characterized the job, it was rock. This was recognized by a rock clause in the construction contract. Rock was not confined to the eastern Osage country, however. When the sandstone of the hills disappeared, it was replaced by the harder limestone hidden close to the surface of ranch and farm land of North Central Oklahoma.

G. C. (Red) Chestnut, chief inspector for Cherokee and a 28-year pipeline veteran who conducted a special tour of the job for the Journal pipeline editors, called it "the roughest I ever saw in Oklahoma."

FORTY YEARS of pipelining are seen where Cherokee line crosses Service Pipe Line crude system, with four lines ranging from 8-in. laid first to recent 20-in.

Ditching . . . This was the limiting factor on spread progress. The ditch gang made around 4,000 ft. per day through the Osage Hills, working 7 days a week as did the right-of-way crew.

The ditch gang didn't take a day off in the first 2 months after the April 1 kickoff. It got rained out a time or two briefly, but the spring showers caused scarcely any interruption (but left bog holes where towing equipment was required).

There were two ditchers in the gang, working individually, making a pass where rock was not on the surface. Rock kept one broken down most of the time. Four wagon drills were kept busy drilling the rock ahead of the powder gang, which had 10 to 12 men threading sticks of dynamite, stringing primacord in the ditch, planting dynamite, and connecting it to the primacord. A pair of blast holes was punched every 4 ft. and a stick of dynamite placed in each. The ditch was shot about 300 ft. at a time.

WAGON DRILLS punch twin holes in rock for powder gang to plant dynamite at 4-ft. intervals.

Blasting brought out rattlesnakes and copperheads in large numbers. Several of the poisonous snakes were killed, most of them in the powder gang.

Four backhoes followed up the blasting crew, cleaning out and deepening the ditch, and two worked ahead of the drills. The hoes were able to cut through some sandstone but most of it had to be shot as well. One dragline was used to clean out the ditch. Padding was required from 6 in. below to 6 in. above the pipe.

Dirt was obtained from the right-of-way and hauled in four front-end loaders. In creek bottoms and on hillsides where there was danger of the pipe washing out, it was anchored by sand bags. One of the major problems was disposing of rock.

Congested areas . . . The most tedious phases of the project were crossing The Texas Co. refinery yard and the Frisco Railroad yard in West Tulsa. Cherokee's main line crossed 189 other lines in the refinery yard, where hand tools were used almost exclusively, and several lines outside the refinery, with rought tie-ins and lots of sections.

Twenty-five days were required to bore under the Frisco yard, 739 ft. wide. The D-X Sunray Oil Co. refinery connection was relatively simple since the line crossed the tank farm and encountered few other lines.

In the congested area the contractor had to work on the right-of-way restricted in some cases to 40 ft. or less, dictating the use of backhoes and hand ditching. Pipe through 3½ miles of this industrial district was yard coated.

There were 31 cased crossings in the Glennpool-Sand Springs industrial area.

PIPE GANG made 6,000 to 8,000 ft. per day, easily keeping up with the ditch, which set the spread pace. Welders furnished their rigs except for stringer bead and hot pass.

CONSTRUCTION BOSSES included (left to right) J. H. Shannon, Pipeline Service Co.; G. C. Chestnut, Continental Pipe Line; and G. P. Merrill, Pipeline Service.

Stations . . . Oil Capital Construction Co. had the contract for the booster stations. A 200-hp. unit was installed at the D-X refinery and a 400-hp. unit at Texaco, both electric driven. The Ponca City station on Cherokee's existing system will be expanded by 700 hp., giving the new line initial capacity of 60,000 bbl. per day.

The expansion also involves station construction at Glennpool, Afton, Mt. Vernon, Richland, and Belle, on the dual 10-in. system from Glennpool to Wood River, Ill. One of these two lines, both built for crude service 28 years ago by Ajax Pipe Line Corp., has been operated as a products line sinc 1954 and the other is being converted to products this summer after being tested and treated with a 15% solution of hydrochloric acid to remove rust and scale.

Welding . . . Five welders were working on the firing line, two on stringer bead, two on hot pass, two on tie-in, and one as a utility welder, making 12 welders on the spread. It was a rig job with the exception of stringer-bead and hot-pass welders.

The pipe gang made 6,000 to 8,000 ft. per day in the rocky and hilly terrain, working 10 hours a day, 6 days a week. The pipe easily kept up with the ditch, which set the spread pace.

The 12-in. pipe was bent against a shoe off the side of a tractor. From Ponca City to Fairfax, the pipe was X52 seamless with ⅜-in. wall, and from Fairfax to Glennpool, X46 electric weld with ¼-in. wall.

Corrosion protection . . . The pipe was coated over the ditch, except for the congested areas, with coal tar, glass fiber, and felt. The yard coating was done at a railhead in West Tulsa.

The dope gang, working 6 days a week, kept close on the heels of the pipe. On the day this gang was visited it made 11,100 ft. before quitting at 4 p.m. when it caught up with the pipe. Progress ranged from a low of 3,500 to 13,500 ft., with the average about 9,000 ft.

Coating was subcontracted by Pipeline Service to Secrest Pipe Coating Co., Tulsa. Pipe was cradled into the ditch behind the coating and wrapping machine.

The line will be cathodically protected throughout by three recitifier installations.

River and road crossings . . . Cherokee made two major crossings of the Arkansas River, one at Ponca City and the other at West Tulsa. The latter, 1,731 ft., was the longer of the two.

River crossings were contracted to M-R Co., Wichita, Kans. Trench for the submarine crossings was dug by two draglines, working off the side of a fill out into the stream. When the halfway point was reached, a fill was constructed from the other side, diverting the river again, and this half of the crossing was completed.

This method, adding a joint at a time from the fill, was selected over the push method because the bank rose too sharply from the river and the levee could not be cut to provide necessary working space. The Ponca City crossing was pulled in the conventional manner. Once the trench was 80% completed when it was lost because of a rise in the river.

Several creeks were crossed, including Salt Creek near Ralston, which was 8 to 11 ft. deep with a rock bottom which had to be blasted. One road crossing in Tulsa County was made with dynamite also. Special permission was obtained from the county to use dynamite since the limestone and flint ruled out ordinary boring or tunneling. Road crossings were subbed to Oklahoma Road Boring, Inc. Highway 20 was cut since it was solid limestone and could not be bored.

Construction supervision . . . The project was directed by D. S. Skinner, of Continental Pipe Line Co., operator for Cherokee which is owned jointly by Continental Oil Co. and Cities Service Pipe Line Co. G. C. Chesnut, Continental, was chief inspector.

Supervising the job for the prime contractor were G. P. Merrill, president and general manager of Pipeline Service; J. H. Shannon, vice president and general superintendent; and John Welcher, spread man.

REFINING

A new method for

Regeneration of alkaline solutions

. . . used in extracting mercaptans from petroleum distillates

BY B. C. PHENIX, JR.
Magnolia Petroleum Co.

THE METHOD maintains a water balance in the treating solution by increasing the regeneration temperature above the limit usually recommended for oxidizing mercaptans. Removal of water is done simultaneously with the oxidation of the mercaptides. The method offers these advantages:

- Close control of the strength of solutizer solutions.
- Ability to control solutions at maximum strength promotes improved mercaptan extraction, increased disulfide removal, decreased chemical consumption, and longer solution life.
- Increased removal of mercaptan and disulfide sulfur provides TEL savings resulting from the improved octane rating of treated motor fuels.

Extraction process . . . Strong alkaline solutions are used for extracting mercaptans in solutizer and other processes. The spent solutions are regenerated by blowing with air or steam. The choice between the two methods depends on economics which is closely related to the type of mercaptans present in the gasoline and to the cost of steam. Regeneration by blowing with air is common.

In the extraction step water is formed as shown by the following equation representing the reaction:

$$RSH + KOH = KSR + H_2O$$

where R is an organic radical and K may be potassium or sodium.

In air blowing the spent solution, the mercaptides formed in the extraction step are oxidized to the disulfides. In this reaction water is consumed as shown below:

$$4KSR + O_2 + 2H_2O = 2R_2S_2 + 4KOH$$

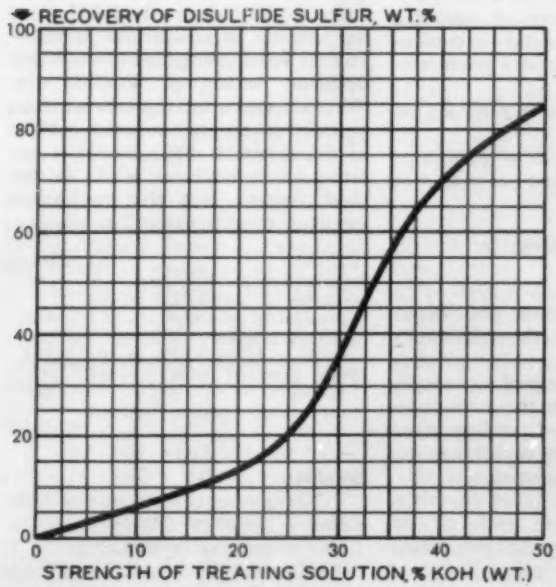
By combining the two equations it is apparent that water is produced in the process:

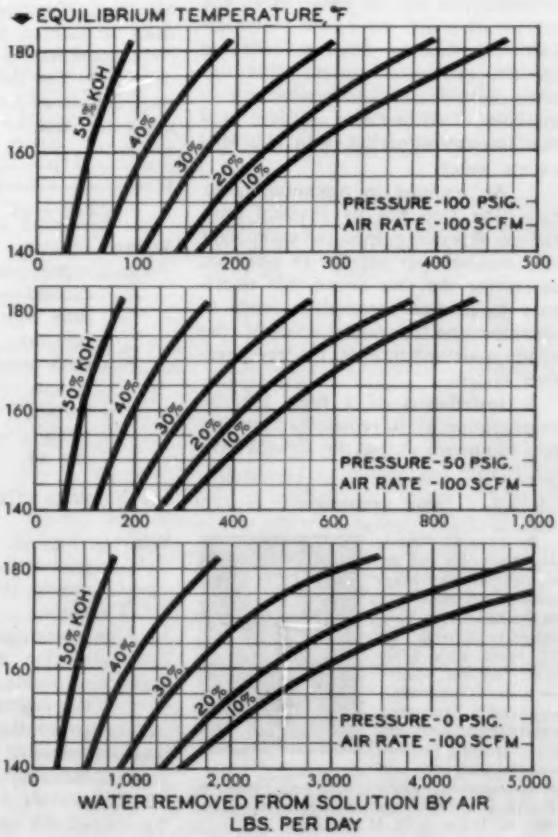
$$4RSH + O_2 = 2R_2S_2 + 2H_2O$$

Disulfide removal . . . The disulfides

RECOVERY OF DISULFIDES by settling increases with strength of treating solution. Fig. 1.

EQUILIBRIUM BETWEEN solutions of potassium hydroxide and moist air. Fig. 2, top right; Fig. 3, middle right; and Fig. 4, bottom right.





are soluble in gasoline and must be removed from the regenerated solution to prevent the reentry of sulfur compounds into the gasoline during the extraction stage.

The disulfides are separated from the regenerated alkaline solutions by settling and decanting. Completeness of separation at the plant depends on several factors including the strength of the alkaline solution. Under similar conditions, an increase in the strength of the potassium hydroxide solution favors separation of the disulfides as shown by the typical data presented in Fig. 1.

The data show that in processing a West Texas gasoline an increase in the strength of the potassium hydroxide solution from 35 to 50% improved the recovery of the disulfides in the regeneration step from 56 to 84%.

Water rejection . . . Water removal from the alkaline solution during air regeneration is not a serious problem when the water can be removed at normal regeneration temperatures of 130°-150° F.

Water can be removed from the solution only as a vapor in the air rejected from the system.

When the quantity of water entering the solution exceeds the amount of water that can be removed by the regeneration air, the excess water dilutes the treating solution, reducing its life, extraction power, ability to settle disulfide oils, and increases treating costs. Two methods are used now that accomplish partial removal of this excess water.

1. An increase in regeneration air rate. The step has its physical limitations depending upon the equipment and available air supply. In addition, increasing the rate above that necessary to oxidize mercaptans tends to decrease the residence time of the solution-air mixture in the regeneration system.

2. Installation of a drier for the regeneration air to reduce its humidity to a minimum so that the air will have additional capacity for removing water. This method also has its limitations depending upon the equipment.

New Method

The proposed method[1] maintains a water balance in the treating solution by increasing the regeneration temperature above the limit usually recommended for oxidizing mercaptans. This may require installation of additional heater capacity. Raising the temperature increases the vapor pressure of the treating solution so that additional water is vaporized and carried out of the system by the residual air. The capacity of the air to carry water vapor per unit volume increases rapidly with temperature.

Removal of the excess water under the above conditions is done simultaneously with the oxidation of the mercaptides. The recommended method increases the life of the solution, raises its extraction power, and provides for adequate settling of disulfide oils with resulting improvement in the octane rating of the gasoline. The improved settling results from the increase in density of the solutizer solution and decreased solubility of disulfides.

Removal temperature . . . The effect of temperature on water removal by air from potassium hydroxide solutions of different strengths at equilibrium conditions is shown in Figs. 2, 3, and 4. The data for these curves were calculated for different pressures using the following equations:

$$H = \frac{18p}{29\,(P - p)} \text{ or } \frac{0.6207p}{(P - p)} \quad (1)$$

Where:

p = vapor pressure of mm. Hg exerted by solution in equilibrium with air at a given temperature.

P = total pressure in mm. Hg on system.

H = humidity of air or pounds of water absorbed per pound of dry air.

$$W = (C)\,(A)\,(\Delta H) \quad (2)$$

Where:

W = pounds of water per day removed from the solution by the air.

A = pounds per day of air in equilibrium with the solution.

C = a constant depending upon the degree of equilibrium between the solution and air.

ΔH = humidity of outlet air minus humidity of inlet air in pounds of water per pound of dry air.

The charts are based on 100 s.c.f.m. of bone-dry air or A = 11,000 lb. per day, and pressures of 0, 50, and 100 psig.

Similar curves may be prepared for treating solutions of different compositions by using Equations 1 and 2, if the vapor pressure, temperature, and strength relations are known.

Dilution effect . . . Water formed in processing gasolines for the removal of mercaptan dilutes and alkaline solutions. This reduces the efficiency of both the extraction and the regeneration steps. The quantity of water produced each time the caustic solution is circulated through the system is small but the effect is cumulative.

For instance, in the oxidation of 1,000 lb. of mercaptan sulfur to the disulfides 275 lb. of water is produced. Assuming that 125,000 lb. of potassium hydroxide solution containing 40.0% by weight of potassium hydroxide is required for the extraction of mercaptans the strength of the solution is reduced from 40.0 to 39.8% of potassium hydroxide.

At the plant this dilution is obtained in about a day of operation. After a 3-month period, the strength of the potassium hydroxide solution is reduced to 22% which greatly affects its extraction efficiency.

Solution of Plant Problems

The following examples illustrate the application of the method to the solution of plant problems by using the data presented in Figs. 2, 3 and 4.

Example 1 . . . The regeneration system of a gasoline treating unit oxidizes 4,000 lb. per day of mercaptan sulfur to disulfides in the KOH treating solution. It is desirable to maintain the KOH strength of 40 wt. % for optimum settling of disulfide oils. What should be the regeneration temperature to maintain a water balance in the system if the total water entering the solution is 1,320 lb. per day? Assume that the equilibrium constant (C) of Equation 2 equals 1.

	Conditions
Regeneration pressure, psig.	50
Available air supply, s.c.f.m. (assume air is bone dry)	480
Water of reaction (4,000 × 18)/(2 × 32), lb./day	1,100
Water carryover from prewash, lb./day	220
Total water entering solution, lb./day	1,320

Solution:

1. Oxygen required to oxidize RSH sulfur is (4,000 × 32)/(4 × 32) = 1,000 lb. per day or 80 s.c.f.m.

2. Residual air equals fresh air

THE AUTHOR

Bruce C. Phenix, Jr., is process and design engineer for Magnolia Petroleum Co. at the Beaumont, Tex., refinery. During his 15 years with Magnolia, he has worked on thermal reforming, light-ends recovery, catalytic cracking, distillate-treating process, and blending and manufacturing finished light-oil products. Phenix is a 1939 chemical-engineering graduate of Texas A. & M. College.

minus oxygen for RSH 480 − 80 = 400 s.c.f.m.

3. Fig. 3 for 50-psig. pressure is based on air rate of 100 s.c.f.m., so the abscissa is 1,320 × 100/400 or 330 lb. H_2O per day to be removed.

4. On Fig. 3 reading up from 330 lb. per day to the 40% KOH line the desired regeneration temperature is read on the ordinate as 180° F.

Example 2 . . . What would be the water of dilution buildup in the treating solution of Example 1 if the regeneration temperature were 160° F. instead of 180° F.? Assume that the original solution strength was 40% KOH.

Solution:

1. On Fig. 3, the water removal rate at 160° F. and 40% is 200 lb. per day.

2. With 400 s.c.f.m. of residual air the rate is 200 × 400/100 or 800 lb. per day.

3. The initial water of dilution rate is 1,320 − 800 or 520 lb. per day.

4. The strength of the solution would decline from 40% until a strength of approximately 28% was reached. At this strength, according to Fig. 3, the water-removal rate would be the same as at 40% and 180° F.

Example 3 . . . What would be the maximum water removal rate from 40% KOH solution at 180° F. if the regeneration pressure were 100 psig. and the residual air rate was 400 s.c.f.m.?

Solution:

Reading from Fig. 2, the water removal rate for 40% solution and 180° F. is 185 lb. per day for 100 s.c.f.m. of air.

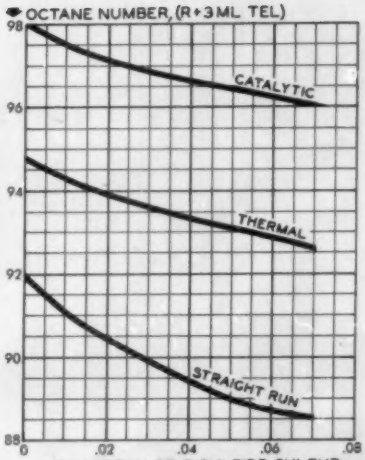
At 400 s.c.f.m. the rate is 185 × 400/100 = 740 lb. H_2O per day.

Example 4 . . . The strength of the KOH solution in a gasoline-treating unit has declined to 20%. The unit will be down several days due to a shortage of feed stocks. It has been proposed to concentrate the solution by circulating it through the regeneration system at a temperature of 180° F. with an air-injection rate of 400 s.c.f.m. The volume of solution is 1,000 bbl. How long will it take to concentrate the solution to 40%, if the pressure on the system is 0 psig.?

Solution:

1. The 20% KOH solution has a weight of 1,000 × 416 lb. per bbl. or 416,000 lb.

2. The solution contains: 416,000 × 0.8 or 333,000 lb. of water and 416,000 × 0.2 or 83,000 lb. of KOH.



EFFECT OF MERCAPTAN or disulfide sulfur on octanes of leaded gasolines. Fig. 5.

3. The 40% solution would contain: 83,000/0.4 or 208,000 lb. of solution and 208,000 − 83,000 or 125,000 lb. of water.

4. So the quantity of water to be removed is 333,000 − 125,000 or 208,000 lb.

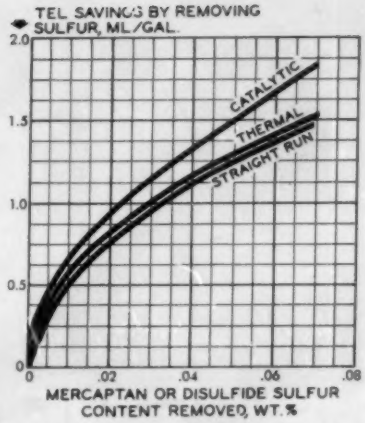
5. The rates at which the water is removed from KOH solutions of various strengths at 0 psig. and 180° F. are obtained from Fig. 4 and shown below:

KOH (%)	100 s.c.f.m. of air	400 s.c.f.m. of air
20	4,650	18,600
30	3,100	12,400
40	1,750	7,000
Avg., lb./day	3,170	12,680

Assuming that the arithmetic average is accurate, the approximate time required to concentrate the solution to 40% is 208,000/12,680 or 16.4 days.

The approximate relation of mercaptan or disulfide sulfur contents to octane number is presented in Fig. 5. Since the effect of these sulfur compounds on antidetonating characteristics of motor fuels is similar, the same curve is used to represent their behavior for a given stock.

In regenerating treating solutions care must be taken to remove disulfides where joint regeneration is practiced, as relatively sweet stocks can be contaminated with disulfides carried by the treating solution. This phenomenon is generally referred to as disulfide reentry. The effect of mercaptan or disulfide removal on tetraethyl lead savings for the above stocks is shown in Fig. 6.



EFFECT OF MERCAPTAN or disulfide sulfur removal on tetraethyl lead savings. Fig. 6.

Example 5 . . . (Application of Fig. 6). The above stocks are charged to three treaters having a common air-regeneration system. The treating solution strength is maintained at 40% KOH which provides disulfide oil settling and removal amounting to 70% (see Fig. 1).

What tetraethyl lead (TEL) savings can be realized with 70% removal of disulfides assuming that the average disulfide sulfur content amounts to 0.05 wt. % of the charge stocks?

Solution:

Disulfide sulfur remaining in treated gasolines (disulfide reentry) equals (100% − 70%) (0.05 wt. %) or 0.015 wt. % sulfur.

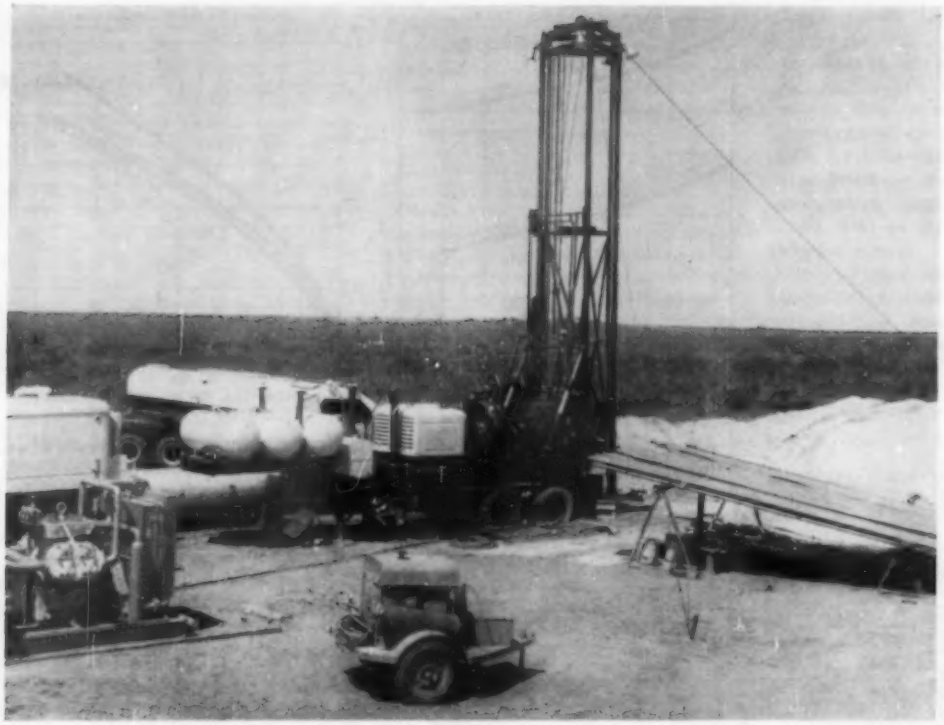
	Light catalytic	Light thermal	Light straightrun
TEL saving if 0.05% sulfur removed, ml./gal.	1.50	1.30	1.26
TEL saving if 0.015% sulfur removed, ml./gal.	—0.79	—0.72	—0.68
Net TEL saving, ml./gal.	0.71	0.58	0.58
or ml./bbl.	29.82	24.36	24.36
and ct./bbl.	6.9	5.6	5.6

Referring to Fig. 6 for TEL savings at 0.05% and 0.015% sulfur.

The disulfide reentry of 30% can be reduced further by washing the regenerated treating solution with a sweet naphtha which can be desulfurized in the hydrogen pretreater and then charged to the reformer. The naphtha wash can improve the above TEL savings by achieving additional disulfide removal.

Reference

1. U. S. Patent No. 2796385, issued June 18, 1957, to B. C. Phenix, Jr., is entitled, "Method of Avoiding Dilution of Solutizer Solutions."



FIRST successful oil-well drilling rig to be powered by hydraulics has tripod mast. Fig. 1.

Using this equipment, Hydro's

Two-man crew operates hydraulic rig

PICTURED on these pages is an oil-well drilling rig that:

1. Is operated by a two-man crew, including making round trips.
2. Has a built-in automatic driller.
3. Has not a single chain drive, gear transmission, nor friction brake.
4. Has only three clutches, one for each engine (even these clutches could be eliminated).
5. Has no wire line other than a swabbing line.

Yet, this rig has successfully drilled more than 20 wells, some of them oil producers. The rig has successfully drilled on contract. It can be torn down, moved, and rigged up quickly. Its initial cost and operating expense are low. These things are made possible by the following features:

1. A three-cylinder long-stroke "jack" for hoisting the drill stem.
2. Hydraulic motor drive for power swivel and sand-line reel.
3. Hydraulic controls on power slips and mud-pump clutch.
4. Compact one-trailer mounting for most rig equipment.

This rig, Hydro Drilling Co.'s Rig 1, has been drilling in Maverick County, Texas, for several months. During that time, the rig has had no major down time for repairs or modification. It is in every sense an oil-well drilling rig; it is not a toy nor a Rube Goldberg device.

Under development 8 years . . . The hydraulic rig was designed by Hydro's owner, John R. Bunn of Tyler, Tex. Bunn says he was looking for a rig that could drill deep wells more cheaply when he started design in 1949. As the design progressed over the past 8 years, Bunn decided to build a portable shallow-well rig to test his ideas. This pilot-model rig, the one described in this article, was assembled by L. L. Templeton of Corsicana, Tex., for a total cost of only about $75,000.

When this pilot model proved reliable in operation as well as low in cost, Bunn decided to license the features of his invention. Houston Oil Field Materials Co. (HOMCO) has recently made an agreement with Bunn and likely will have production models of the rig available soon. One of the first probably will be a workover unit for offshore operations.

BY ED McGHEE
Drilling Editor

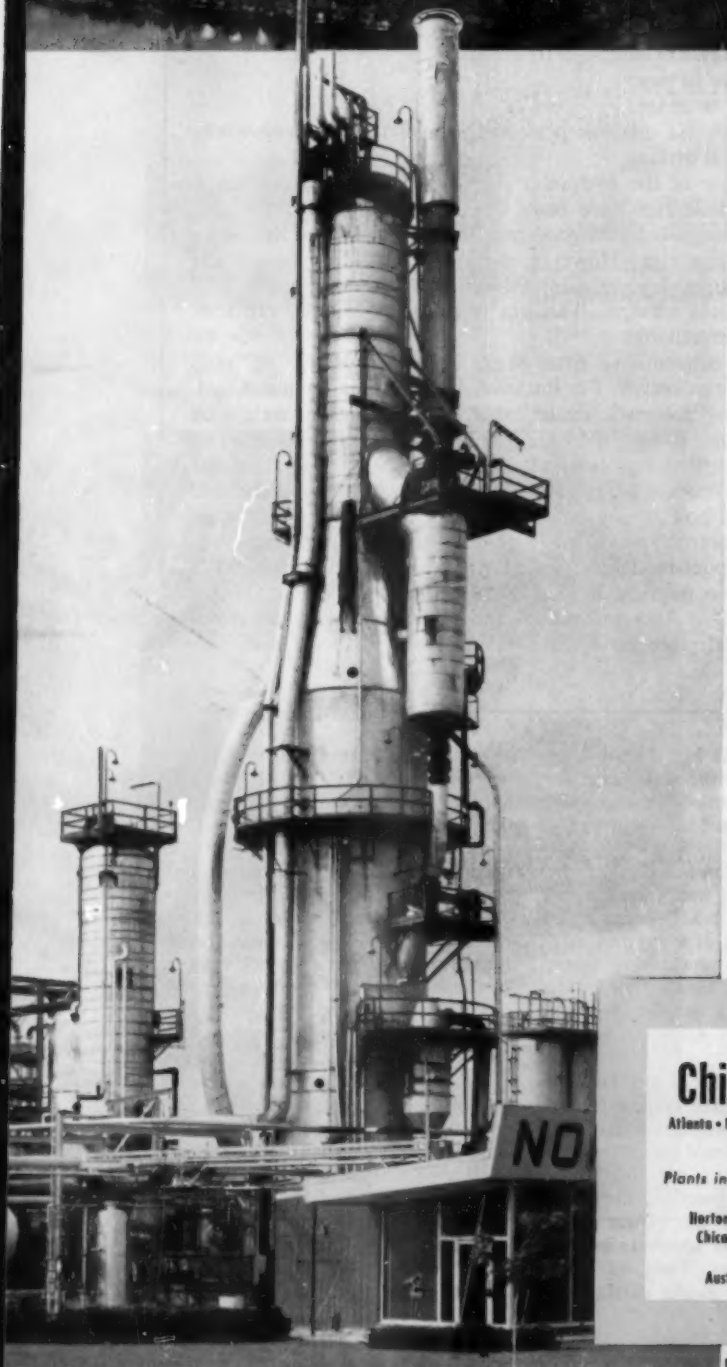
Tripod jack-mast . . . Fig. 1 shows the Hydro Rig. 1 with its mast fully retracted. As the picture shows, the mast is made up of three columns, each of which is a hydraulic cylinder. These cylinders are made from 5-in. N-80 drill pipe stock. Inside the cylinders are pistons made of 3½-in. drill-pipe stock. Oil pressure in the cylinders raises the pistons and the drill stem which is attached.

Fig. 2 shows the mast fully extended. Stroke of the unit is 27 ft. This stroke was set only by the needs of the drilling to be done; future deep-well models likely will be built with a 35 or 40-ft. stroke. Presently, the rig drills with Range 1 (20 to 22-ft.) joints but a sheave arrangement in the top of the mast makes it possible to handle Range 2 (27 to 30-ft.) pipe.

Racked standing or laying down . . . The rig pulls the drill stem in singles and each joint is laid down on the special racks shown in Figs. 1 and 2. On future deep-hole rigs, Bunn visual-

20 CB&I STRUCTURES

serve refinery expansion at Twin Cities



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Top: CB&I-built storage tanks at Northwestern include 80,000 bbl. Horton® Floating Roof crude oil tanks and jet fuel storage tanks.

Left: UOP Cat Cracker at Northwestern includes CB&I-built 10-ft. diam. reactor, 16½-ft. diam. regenerator.

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izes a system in which the pipe could be pulled in singles but racked in doubles standing up. Such a system would be roughly equivalent to the so-called "sky top" rigs which pull singles but rack doubles with conventional wire-line traveling block.

The procedure would be to raise the drill stem one joint and set the slips. Then, without disconnecting this joint, the mast would be lowered to pick up a second joint. The string would be lifted again, the top joint protruding above the top of the extended mast.

With the pipe racked in standing doubles, round-trip time would likely be less than it is now. However, the two-man crew can make a round trip from 2,500 ft. with the drill tubing in as little as 5 hours now. This speed stems from the fact that the drill string can be raised about as fast as on most conventional rigs and that the mast falls faster than the empty blocks on conventional rigs. Actually, the hydraulic rig can make and break connections faster with its power swivel than the conventional rig with manually operated tongs.

At 1,000 psi. . . . The speed with which the rig can raise the drill stem depends on the rate at which oil can be pumped into the jack cylinders. Likewise, the load which the mast can lift depends on the pressure inside the mast cylinders. At maximum design pressure of 1,000 psi. in the cylinders, the mast can lift about 25,000 lb. This represents the load of about 2,900 ft. of 7½-lb. per ft. drill tubing plus another 100 ft. of drill collars.

Thus far, the rig has drilled no deeper than 2,500 ft. At this depth, the drill stem could be raised at reasonable speed with a pressure of 900 psi. in the cylinders.

On future models, lifting capacity of the mast could be stepped up by raising the operating pressure of the cylinders, by increasing the diameter of the cylinders or by using more cylinders. With three cylinders, there has never been any tendency for the piston portion of the mast to bind under load.

On initial designs, the mast was planned to have a downward pull as well as an upward thrust; this downward pull was to come from pressure applied in the upper portion of the mast cylinders. However, it was decided that this downward pull could very seldom be used in the field. So, the design was changed for upward thrust only. The upward-only design makes the mast cheaper because it removes the necessity for close-tolerance machine work on the inside walls of the cylinders. As Fig. 3 shows, the only packing on the cylinders and pistons is at the top where it is easily tightened or replaced.

Why a hydraulic rig?

Basically, the modern draw works, drilling line, crown block, and traveling block are components of a windlass-operated block-and-tackle system. Sole purpose of the system is to hoist the drill stem. Except for refinements and increases in size, the block-and-tackle system is the same today as when first used on cable-tool rigs for handling casing more than 75 years ago.

The draw-works method has survived because it is simple, efficient, and rugged. Doubtless it will be around for a long time to come. But it has disadvantages too. The conventional draw works for handling drill stem requires:

1. A large crew to operate.
2. A big derrick and substructure.

All this equipment is:

1. Expensive to buy.
2. Difficult to move.

Yet, till now, no one has perfected a rival for the draw-works system in oil-well drilling.

The principle of the hydraulic jack is old. For several years, hydraulic shot-hole rigs have been used successfully, and the idea has long been suggested as a good possible way to lift the drill stem on oil-well-drilling rigs. However, the rig described in this article is the first practical hydraulic-lift oil-well-drilling rig to prove itself in prolonged field service. This rig is compact, simple, efficient, economical, and reliable.

Unlike the conventional draw-works rig, the hydraulic rig lends itself to automatic control. For instance, at practically no added cost, it has a built-in "automatic driller" that holds a constant weight on bit while drilling. It has another device that permits setting the rate at which the drill string feeds off. Some engineers even visualize a simple, relatively cheap hydraulic system that would pull the drill string from the hole or run back to bottom without a human hand touching the controls.

While this pilot-model hydraulic rig is designed for only 3,000-ft. wells, there's no physical limitation to its principles being applied to deep-hole rigs. And production-model hydraulic rigs may someday carve a real place for themselves in oil-well drilling, both deep and shallow.

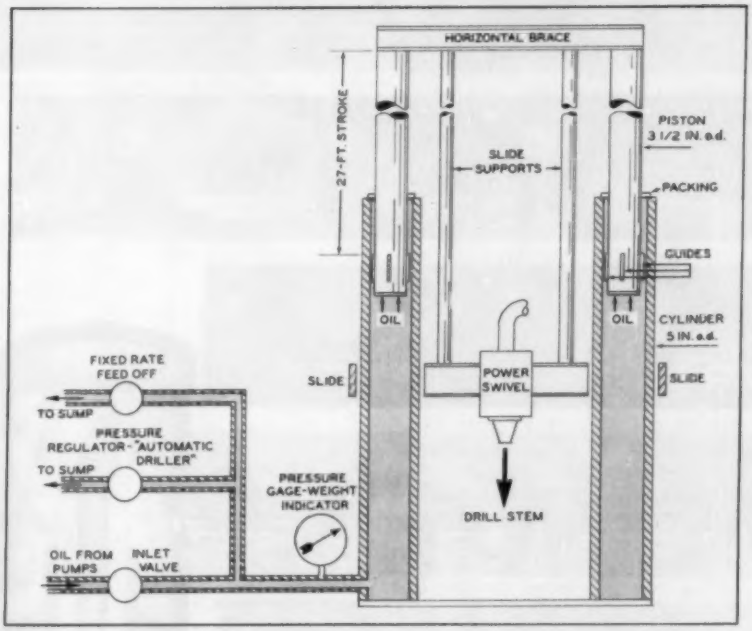
Making a connection . . . Fig. 4 shows the driller's control station on the new rig. The levers in front of the driller allow him to raise or lower the mast, set or release the power slips, rotate the power swivel forward or in reverse, and engage or disengage the mud-pump clutch. All these controls are hydraulic.

Mechanical controls regulate the throttles on the three engines driving the rig. These controls are the same type used on outboard motors and are inexpensive.

To make a connection, the power slips are set and the power swivel rotated in reverse so that it backs off the drill string. Then, as Fig. 4 shows, the power swivel carriage can be tilted to the side to pick up a new joint off the racks. There's no need to tong up the new connection; the power swivel can make up top and bottom connections. There's no need for backup even if there is only one joint of pipe hanging in the slips.

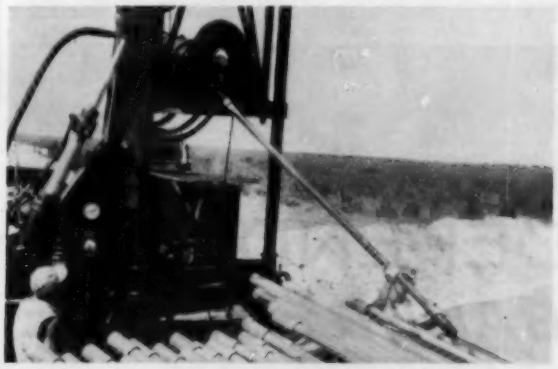
As Figs. 4 and 5 show, making a connection is a two-man operation; there's no need for a derrick man. In fact, all operations involved in making a round trip with the drill pipe can similarly be handled by two men. Bunn made designs for an automatic pipe-handling system with which the driller could make connections and round trips unassisted; thus only one man would be needed per tour. Such an automatic system has already been used on a floating ship drilling off the coast of California. However, it was decided that there should be at least two men on the hydraulic rig in case of emergencies. For that rea-

THE RIG with mast extended. The 27-ft. stroke was fixed by needs of drilling to be done; future models will likely have 40-ft. stroke. Fig. 2.

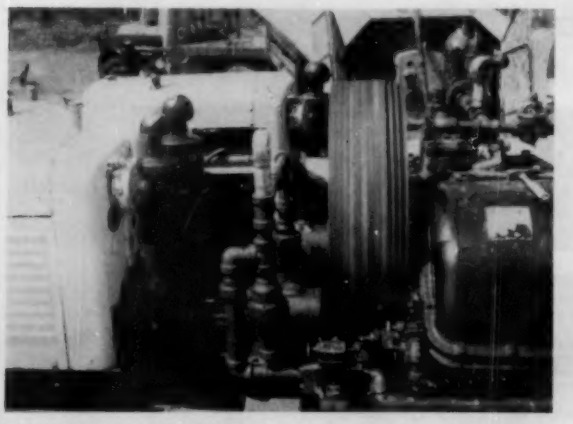


NO SEALING ELEMENTS are inside the cylinders. Hydraulic controls serve as brakes, automatic driller, weight indicator, and fixed-rate feedoff control. Guides opposite power swivel move up and down with pistons. Fig. 3.

ENTIRE DRILLING CREW of rig is shown here. Driller has all controls at his fingertips. Knob above his left hand is control for automatic driller. Dial above his right hand is fixed-rate feedoff control. Fig. 4.



POWER SWIVEL tilts to pick up, lay down pipe. Two-man crew can make round trip from 2,500 ft. in 5 hours. Fig. 5.



INDUSTRIAL-TYPE ENGINES drive oil pumps directly off the rear-end shaft. The belt sheave is for the mud pump on the right; a third engine on the other side of the trailer drives this pump. Fig. 6.

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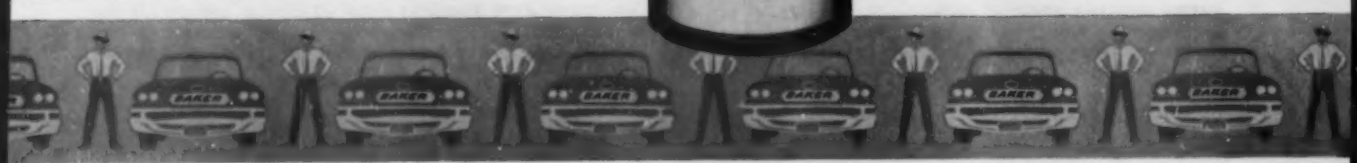

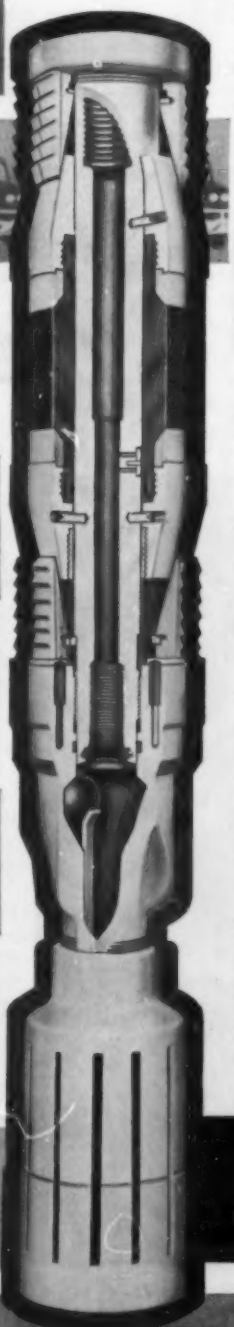

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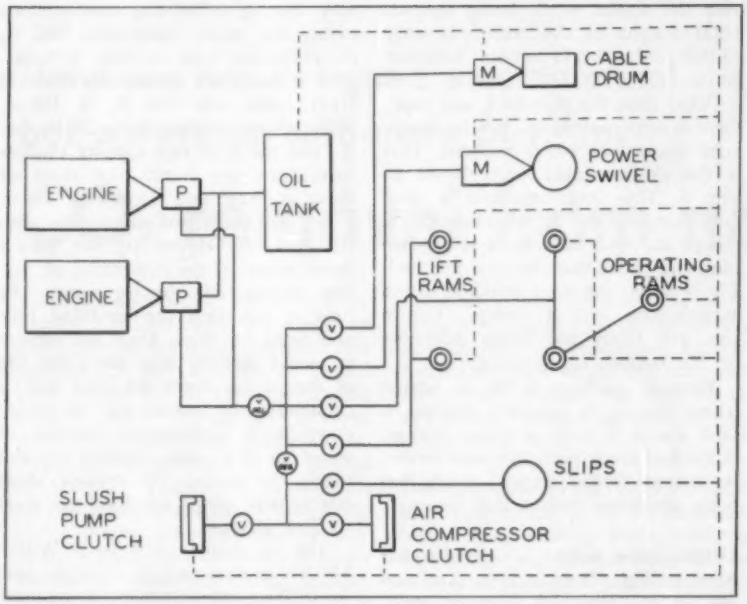


IN HYDRAULIC SYSTEM, oil pumps operate in series to furnish a high-pressure and a low-pressure oil system. Relief valves prevent excess pressure and the pressure-regulating valves can be dumped so that the driving engines do not work against pressure needlessly. Fig. 7.

son, the design for one-man operation was given up in favor of a design for two men.

Two pressure systems . . . Power oil for operating the rig comes from the two pumps shown in Fig. 5. Each of these Vickers V-460 oil pumps is driven by its own Ford butane engine. One engine is rated at 95 hp., the other at 120 hp. The third engine on the rig trailer drives the mud pump through the belt sheave visible in Fig. 6. These industrial engines are relatively inexpensive and can be substituted as packages if need be.

The oil pumps are in parallel and their output is divided into two systems. One is low pressure (150 psi.) to operate the power slips, power swivel, and mud-pump clutch. The other system is high pressure (up to 1,000 psi.) to operate the mast. Fig. 7 shows the hydraulic system.

The driller can control the pressure in the two systems by regulating pressure-relief valves at his station. If he wants more pressure for faster operation or higher torque, he can raise the setting on the relief valves. Or, he can relieve all pressure from both systems.

Hydraulic motors (one on each) run the power swivel and the sand-line reel which is shown in Fig. 8. If more power were needed, additional motors could be added to these pieces of equipment.

Fig. 9 shows the hydraulic actuator on the pump clutch.

There is a 10-bbl. reservoir tank on the trailer for the hydraulic system. While this reservoir contains filters, it does not have a cooling system for the oil. The mast cylinders, oil lines, and the like dissipate very efficiently any heating that may occur in the oil.

Built-in automatic driller . . . A pressure-regulating valve in the oil system makes a reliable, sensitive means for regulating the weight on bit. This valve is a common piece of equipment in other hydraulic-power installations; its cost is extremely low. By adjusting this regulating valve, it is possible to maintain the pressure in the mast jacks constant at whatever pressure the driller wants. Since this pressure determines the lift of the mast, controlling the pressure can control the amount of weight let off on the bit.

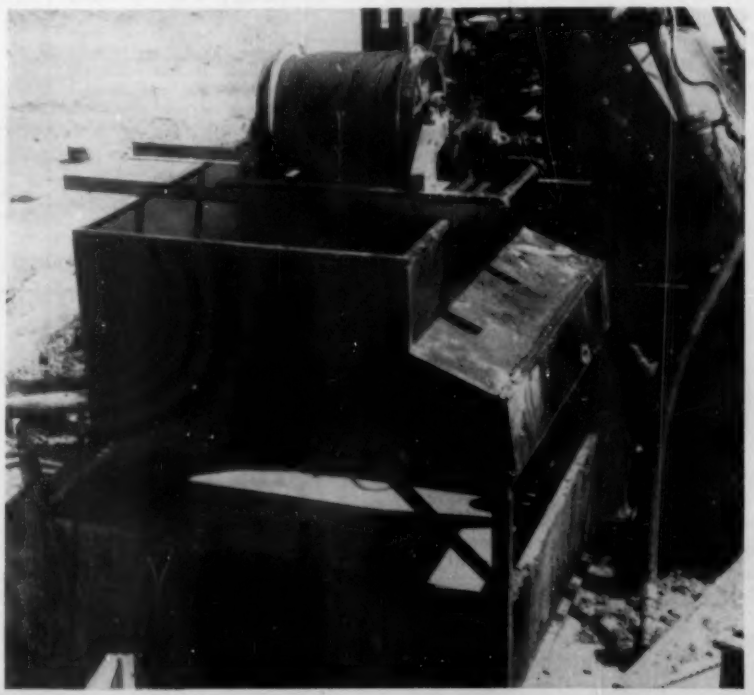
Bunn says that he is confident that the rig's automatic driller can keep the weight on bit within 100 lb. of whatever value the driller wants.

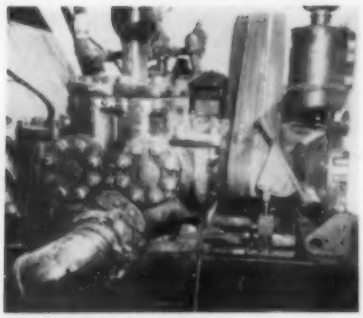
The pressure gage on the oil system to the mast is a direct indication of the weight hanging on the swivel. While the Hydro Rig 1 has only a simple bourdon-tube pressure-gage reading in psi., it would be a simple matter to change the dial to read in thousands of pounds on the swivel. There's no friction loss in this weight indication to cause errors.

Besides the automatic driller, the rig has another inexpensive valve to control operations. This is a valve which lets oil out of the mast cylinders at a constant rate. This, in turn, lets the mast fall off at a constant rate. Thus, the valve controls the rate of feedoff. Such a feedoff controller makes reaming operations much simpler.

Oil-company engineers who have seen the Hydro rig say that it lends itself to automatic control. On the other hand, most attempts at auto-

ONLY MAJOR PIECE of equipment not skid-mounted is this combination unit. On the nearest end it carried a mud tank below, water tank above, and swabbing line on top. Other end of skid serves as substructure. Fig. 8.





HYDRAULIC ACTUATOR on mud-pump clutch works off 150-psi. oil system which also operates the power slips. A 1,000-psi. oil system operates the mast, power swivel, and wire-line reel. Fig. 9.

matic control of conventional drawworks rigs have proved too difficult or too costly.

Brakes not needed . . . There is no need for brakes on the Hydro rig. When going in the hole, the falling pipe can be slowed by pinching down on the valve which lets oil out of the mast cylinders. Shutting the valve stops the pipe completely and quickly.

As a result of this fluid braking, the action of the rig is smooth. There is little noise other than the engines. There is no shock when the pipe is picked up out of the slips or when it is brought to a stop coming down.

Packaging the rig . . . Figs. 10 and 11 show the layout of the trailer on which most equipment is mounted. This carries fuel tanks, light plant, three butane engines, and mud pump, hydraulic motors and pumps, and mast. The mast itself is raised and lowered by hydraulic cylinders and lays down over the trailer when being moved. Total weight of the trailer is only 33,000 bbl., well within highway limits.

Other than the pipe rack and pipe, there is only one major item of equipment that is not wheel-mounted. This is the skid-mounted unit shown in Fig. 8. This unit combines a mud tank alongside the tripod substructure. Above the mud tank there is a water tank and above that the sand-line reel. Fig. 4 shows the mast attached to the substructure with C-clamps. Future rigs will likely use screw adjustors on the bottom for leveling.

Because surface water is scarce where the rig is presently drilling, a tank trailer is used as water storage. A flat-bed truck pulls this tank trailer. A second "bread wagon" truck has been converted into a dog house.

Drilling slim holes . . . Hydro has been setting 6⅝-in.-o.d. surface casing in its Maverick County wells. Then, a 5⅝-in. hole is drilled to total depth and 4½-in.-o.d. casing set as oil string.

Much of the drilling has been with air as the circulating fluid instead of mud. Fig. 12 shows the engine-driven Gardner-Denver compressor purchased for this. The $75,000 figure quoted as cost of the rig does not include cost of the compressor skid.

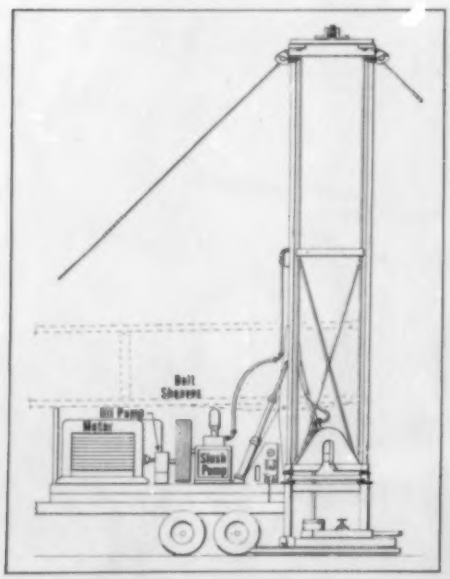
Hydro has been coring with air, and thus far, using a double core barrel, core recovery has always been close to 100%.

Air is profitable because it drills faster than water or mud; on one well, the rig drilled out from surface casing and made more than 600 ft. of additional hole in only 3 hours. This is the more remarkable because Hydro uses only 100 ft. of 3⅛-in. drill collars weighing only 26 lb. per ft., and the Maverick County shallow formations are hard, like most of these in West and Southwest Texas.

To further speed operations and cut cost, the Hydro rig has been doing much of the cementing on surface strings with the rig pump. The pipe is run into the air-filled hole and hung on slips. Then the cement is mixed directly into the open top of the casing. Since the mud tank is calibrated, the cement can be chased down with a measured amount of water so that some cement remains inside the casing. No cement shoes nor cement plugs are used on these shallow strings.

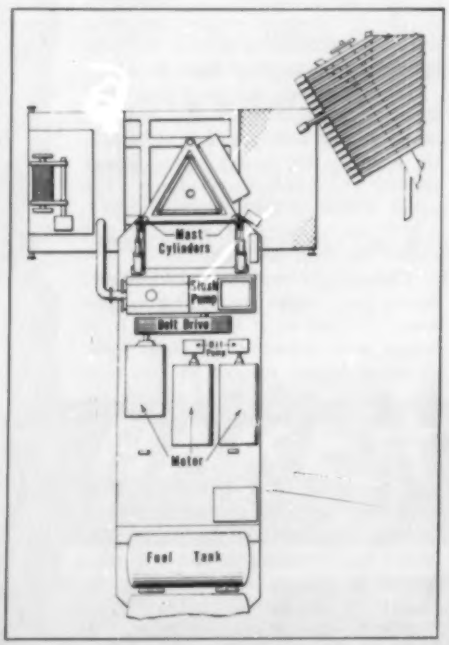
The rig pump, an 8 by 5 Wilson Snyder, is also used to circulate mud for drilling when air is not being used.

HYDRO RIG has skid-mounted air compressor as part of regular equipment. Hard, dry formations of Maverick County can be drilled quickly and cheaply with air. Many cores have been taken with the air method, and recovery has been 100%. Fig. 12.



PILOT model rig had total cost of only $75,000. Substructure shown here is on separate skid; on future models it may be included on the trailer with screw adjustors added for leveling. Fig. 10.

WEIGHT on trailer is 33,000 lb., well within highway limits. Mast folds back over trailer for moving. Fig. 11.



Petrocon has designed a commercial hot potassium carbonate plant for

CO_2 removal from natural gas

BY B. O. BUCK AND ANGUS R. S. LEITCH
Petrocon Engineering Co., Compton, Calif.

TWO YEARS AGO, Petrocon Engineering Co. undertook the design of a commercial hot potassium carbonate plant which was the first of several such plants for removal of carbon dioxide from natural-gas streams. Basic data came from pilot-plant information as published by the Bureau of Mines,[1,2] and bench experiments by Petrocon. In conjunction with the initial studies, extensive relative economic studies were made to compare the amine, water absorption, hot-carbonate processes, and combination of all schemes.[3]

Area of Application

Any specific purification scheme has its own area of optimum use. The advantages of the hot carbonate process are best realized at pressures above 250 psi. and with gas compositions from 50% to 5% acid gas on the inlet, with extraction of the acid gases to a purity as low as 0.5%. A greater purity will require special consideration. Such special considerations will allow the reduction of hydrogen sulfide content to less than 0.25 grains H_2S/100 s.c.f., which is the common pipeline specification for natural gas.

The system is similar in many respects to an amine unit. The major items of equipment such as the contactor, regenerator, circulating pumps and reboiler surface are essentially the same. Since absorption and regeneration steps both occur at the same temperature in the hot carbonate process, no liquid heat exchangers are required.

In a natural-gasoline plant the logical location for the process is on the compressor discharge before cooling and dehydration. Additional heat for regeneration can be derived from various sources of waste, for example, the still reflux systems, hot lean oil, and jacket-water heat.

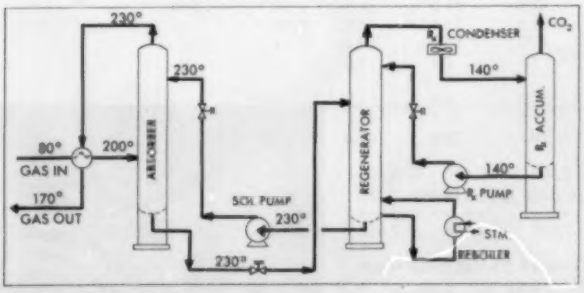
Hot-carbonate system . . . Fig. 1 shows the components of a hot-carbonate plant. Acid-bearing gases enter the base of the contactor, either hot or cold, where they are countercurrently contacted by the carbonate solution. Treated gas, leaving the top of the contactor, is saturated with water and is cooled prior to delivery to a pipeline for dehydration, and to recover the water. Carbonate, the continuous phase, is pumped to the top of the contactor and trapped from the bottom by a liquid-level control. It passes directly to the regenerator where the heat of decomposition is added. Carbon dioxide leaves the top of the stripper through a back-pressure regulator. Water carried out by the carbon dioxide may be recovered in a condenser or vented, depending on the value of water. This particular scheme is best suited for removal of acid gases from streams containing 5% or higher of acid components. The practical limit of residue purity is about 1%.

Split-stream carbonate system . . . Fig. 2 shows a split-stream carbonate process, applicable to natural gas having a very high acid-gas content. A partially stripped stream of hot carbonate is fed to the lower section of the contactor where the acid-gas partial pressure is high. The remaining portion of the carbonate is thoroughly regenerated in the reboiler and returned to the top part of the contactor where the final extraction takes place. This method is desirable for a minimum fuel requirement where economics justify the extra equipment. The same practical limits as in the basic carbonate unit apply.

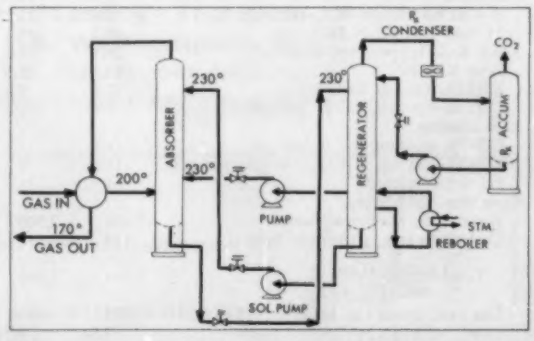
Water-carbonate process . . . The flow diagram in Fig. 3 shows a combination water absorber and a hot-carbonate process. This scheme is only applicable to very high acid-gas streams with carbon dioxide content near 50%. Because of the high hydrocarbon absorption, this process is usually unattractive, but where a large quantity of low B.t.u. fuel (300 B.t.u.) can be used, it may be acceptable.

Partially cooled carbonate process . . . Fig. 4 shows the same process as Fig. 1, with the addition of a lean carbonate cooler for a portion of the stream. Cooling the carbonate decreases the equilibrium carbon dioxide pressure in the carbonate for use at the top of the contactor. This scheme is used to reduce the off-gas to a low acid-gas specification. If the circulation of the cooled solution is high enough, this scheme can eliminate a

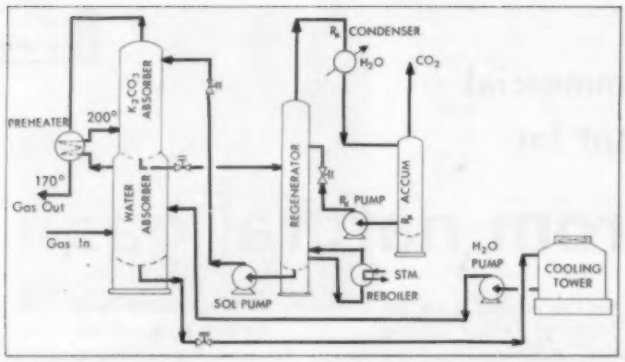
Paper presented at NGAA meeting, Dallas.



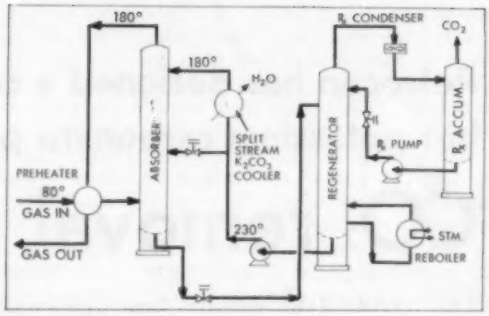
THIS hot-potassium carbonate plant scheme is best suited for streams containing 5% or higher of acid components. Fig. 1.



THIS is split-stream hot-carbonate system, applicable to natural gas with a very high acid-gas content. Fig. 2.



WATER-CARBONATE process, applicable only to very high acid-gas streams with CO_2 content near 50%. Fig. 3.



HOT-CARBONATE process with cooled split stream. This scheme is used to reduce the offgas to a low acid-gas specification. Fig. 4.

gas cooler. The practical limit for this process is in the order of 0.1% acids in the residue. This scheme may be combined with the split-flow scheme of Fig. 2 to advantage. A modification of this system, in which a small stream of potassium hydroxide is fed to the top of the contactor to react with the carbon dioxide or hydrogen sulfide, will result in high residue purity. The reacted bicarbonate or bisulfide is fed to the system as makeup.

Carbonate-amine process . . . Plants are under consideration using a combination of carbonate-amine.[4] The carbonate process preceding the amine unit removes the bulk of the acid gases more cheaply than can the amine process. Amine then treats the reduced gas to produce a residue of pipeline specifications. This process required duplication of equipment which usually makes the cost prohibitive.

Commercial Plants

Our experience with commercial plants indicates that the hot-carbonate process, with respect to economics, is very much as reported in the literature by the Bureau of Mines. Directly scaled up, most pilot-plant data must be modified for a commercial installation. This is true of the published Bureau of Mines pilot data. For example, it is not practical to operate with a 40% solution. At the 40% level, the solution may become oversaturated with respect to bicarbonate at normal absorption levels, which may result in erosion of piping, pumps, and other points in the equipment where there are local high velocities. Fig. 5 shows the solubilities of carbonate and bicarbonate in mixed salt systems. It is apparent that crystals of bicarbonate can be laid down above a concentration of 30% carbonate equivalent. Below 30% carbonate, conditions are such that the bicarbonate does not precipitate.

In practice, it is not possible or practical, to attain the high specific rate of absorption indicated by the pilot-plant tests. In actual operation, a more practical limit is 2½ to 3 cu. ft. per gal. acid-gas pickup vs. a pilot-plant data indicated value of 4 to 5 cu. ft. per gal.

Heat Requirement

Heat requirements in the regeneration of hot-potassium carbonate solutions are dependent primarily on two factors:

1. The unit acid-gas pickup.

TABLE 1—OPERATING DATA, HOT-POTASSIUM CARBONATE ACID-GAS-REMOVAL SYSTEM

	Solution contains antifoam						Slug antifoam		
	G-1	G-2	G-3	G-4	G-5	G-6	H-1	H-2	H-3
Material balance:									
Gas to contactor, M.c.f.d.	3,015	6,270	8,480	4,320	2,595	8,560	5,795	2,080	1,130
Contactor outlet, M.c.f.d.	2,974	5,913	8,177	4,112	2,457	8,240	5,493	1,986	1,097
CO_2 balance:									
CO_2 to plant, M.c.f.d.	222	475	628	332	202	660	440	150	81.4
CO_2 to stack, M.c.f.d.	141	265	303	208	138	320	302	94.0	77
Per cent absorbed	63.5	56.0	48.2	62.7	68.3	48.5	68.6	62.6	95
CO_2 analyses:									
Per cent inlet	7.4	7.6	7.4	7.7	7.8	7.7	7.6	7.2	7.2
Per cent contactor residue	2.8(1.6)	4.0(3.5)	4.5(4.0)	3.0(3.0)	2.0(1.6)	4.0(4.1)	2.7(2.5)	1.7(2.8)	*0.4
Lean solution:									
Rate, g.p.m.	95.9	95.9	95.9	95.9	95.9	117.5	84.2	95.0	95.0
Specific gravity	1.255	1.26	1.226	1.26	1.27	1.275	1.205	1.23	1.23
P Alk. E.P. 0.1-N HCL/ml.	12.0	13.5	14.2	15.0	16.6	15.0	....	....	....
M Alk. E.P. 0.1-N HCL/ml.	46.3	46.2	49.7	51.8	53.4	51.3	....	....	....
Eq. K_2CO_3, per cent weight	26.1	25.2	27.9	28.0	28.9	27.7	30.0	....	....
Free K_2CO_3	13.5	15.6	15.9	16.8	18.5	16.7	....	....	....
$KHCO_3$ (as eq. K_2CO_3)	12.6	9.6	12.0	11.2	10.4	11.0	....	....	....
CO_2 in solution, cu. ft. per gal.	3.6	2.8	3.3	3.3	3.0	3.2	....	....	....
Rich solution:									
CO_2 in solution, cu. ft. per gal.	4.6	5.4	5.5	4.8	4.0	5.1	....	....	....
$KHCO_3$ (as eq. K_2CO_3), weight per cent	16.0	19.2	19.6	16.7	13.8	17.5	....	....	....
Per cent reacted	61.5	76.6	70.3	59.5	47.6	63.1	....	....	....
Contactor circulation:									
Water rate, moles per hour	2,480	2,500	2,500	2,500	2,500	3,050	1,960	....	....
Carbonate rate, moles per hour	114	110	125	126	130	154	118	....	....
Total	2,594	2,610	2,625	2,626	2,630	3,204	2,078	2,680	2,460
Gas rate, moles per hour	331	689	934	475	285	941	637	228	125
L/V	7.84	3.79	2.81	5.53	9.25	3.40	3.26	11.7	19.7

*Basis for computation: Value by material balance.

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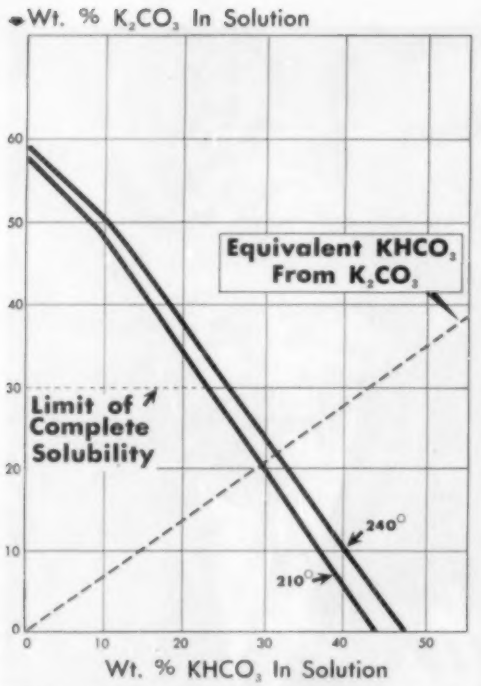
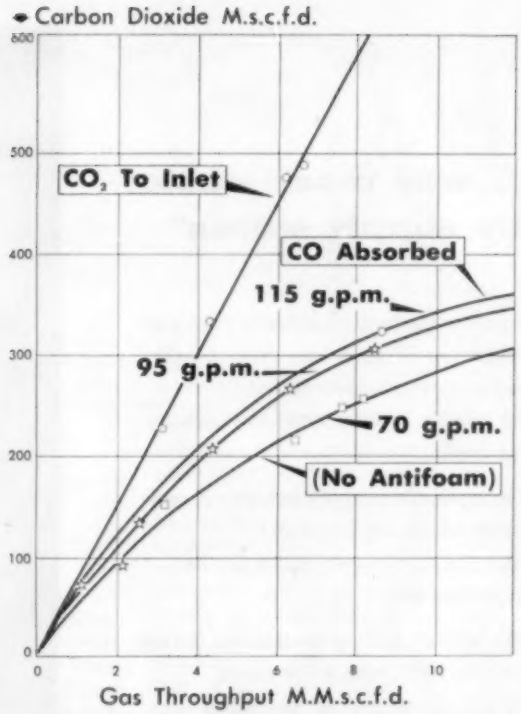


MIXED salt solubility K_2CO_3-$KHCO_3$ system. Fig. 5.

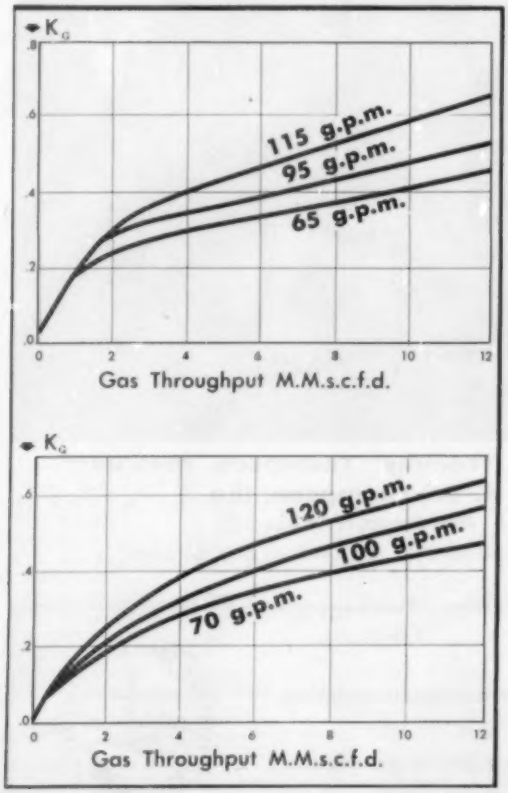


OPERATING DATA (metered) acid-gas removal with varying vapor and liquid loading. Fig. 6.

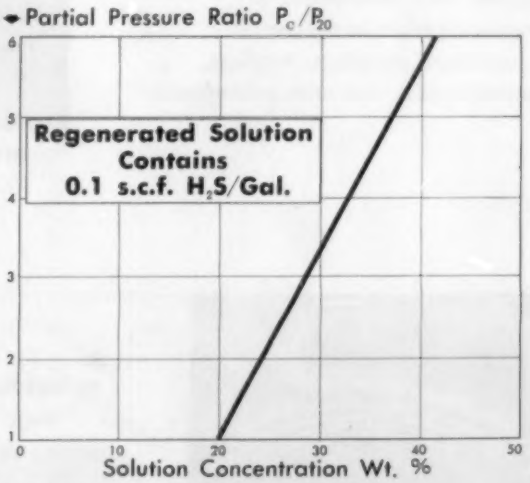
2. The level of regeneration of the lean solution.

The first factor is relatively constant for any particular installation, and can be reported on a cubic-foot per gallon basis. The level of stripping of the lean solution is the determining factor in establishing heat requirements. Bureau of Mines data indicate up to 10 cu. ft. of carbon dioxide may be regenerated by 1 lb. of steam. Petrocon's experience indicates that these figures should be applied judiciously, that the actual plant requirements may be somewhat greater, since this is dependent upon the concentration of the carbon dioxide in the feed gas.

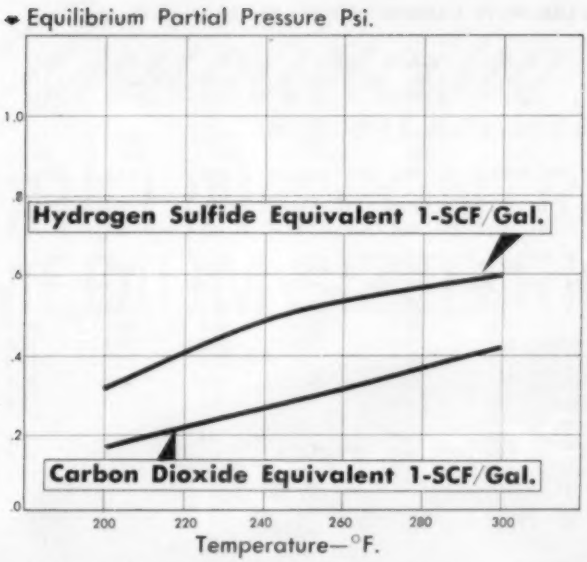
The quantity of heat required for hot-potassium carbonate system is, roughly 0.6 to 0.8 of a pound of steam per gallon of fluid circulated, compared to 1.1 to 1.3 lb. per gal. for an aqueous-MEA unit.[6] This is due to conservation of the exothermic heat of reaction between the carbon dioxide and the carbonate plus a savings in sensible heat due to contacting the carbonate hot.



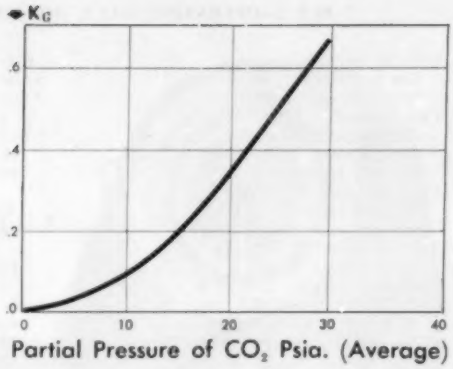
EFFECT of gas velocity on specific absorption rate, with antifoam (top) and without (bottom). Fig. 7.



VARIATION of specific absorption rate with average partial pressure of CO_2. Fig. 8.



EQUILIBRIUM PRESSURE of acid gas over reconstructed regenerated hot-carbonate solution. Fig. 9.



RELATIVE partial pressures H_2S over regenerated hot carbonate at about 230° F. Fig. 10.

Heat recovery . . . One plant gains all of the heat for the process from the jacket steam generated by reciprocating compressor engines. Steam is generated in the jackets in the 13 to 20-psig. range and the reboiler process requirement is for 12 to 13-psig. steam. For order of magnitude, the heat from a jacket-water system on compressors pumping gas from atmospheric pressure to 500 lb., would provide enough heat to remove 8 to 10% acid gases from a gas stream by use of the carbonate process.

Corrosion

The carbonate process is considered noncorrosive for specific operating conditions.

Experience with commercial units to date indicates that carbon steel is adequate for construction throughout the plant, with one exception. Stainless steel should be used where velocities of the fluid are high.

Corrosion found in carbonate systems to date can be stopped in the following manner:

1. Carbon-steel cases and impellers of pumps circulating a 40% solution, where a bicarbonate slurry is actually formed, will last only a few hours. Reduction of the solution concentration to 20 or 25% and adequate regeneration eliminates this severe pump corrosion. There is apparently no affect on the absorptive capacity in a commercial unit due to a reduction in concentration. Stainless - steel case rings and throat bushings in pumps are recommended as a safety feature.

2. The throttling valve and piping where liquid from the contactor flows to the regenerator has viscosities high enough to cause erosion.[5] It is advisable to use stainless steel in this area, particularly since the cost is small.

3. Corrosion from oxygen is controlled by maintaining approximately 0.2 wt. % potassium dichromate as an inhibitor. Potassium dichromate in the presence of hydrogen sulfide reacts with the hydrogen sulfide to tie up this material so that it cannot make further reactions with the oxygen, however, hydrogen sulfide is itself an effective corrosion inhibitor, provided there is a sufficient concentration present. Experiments are being conducted with other inhibitors which do not react with the hydrogen sulfide. It is too early to report on the use of such inhibitors.

4. Reboiler corrosion is controlled by limiting the exit velocities. High pressure steam, hot oil, and direct-fired equipment may be used. This is a latitude denied the amine process by many operators due to adverse effects of high skin temperature.[6]

Hydrocarbon Absorption and Foaming

There is no apparent light hydrocarbon absorption in the hot-potassium carbonate solution, although in one unit absorption oil was recovered from the regenerator accumulator. Mild foaming was experienced in this unit, but was readily checked by the addition of a conventional foaming inhibitor.

Operating Data

Operating data were obtained on a plant over a period of approximately 1 month. Conditions were varied so that the entire range of operability was defined. The effect on acid-gas absorption of liquid rates, gas rates, and partial pressure of acid gas was observed. Some of these operating data are shown in Tables 1 and 2, and in Fig. 6.

Fig. 6 shows the correlation of the metered quantities with the best fit lines through the data. The data were extended somewhat, since the original agreement was good, and the best fit curves were used to calculate further. A pseudo-absorption rate, K_G, similar to that given in the Bureau of Mines data,[1] was calculated for correction purposes.

K_G is defined as a specific transfer rate in M.c.f. per hour of carbon dioxide per pound of average partial pressure, taken over the entire absorber.

Fig. 7-A shows a representation of the specific transfer rate at various gas and liquid loadings in a solution where foaming has been eliminated by the addition of an antifoam agent.

Fig. 7-B is a plot of specific transfer rate against gas loading at varied liquid loadings where no antifoam agent was added.

Fig. 8 shows a marked increase in the specific transfer rate with an increase in the average partial pressure in the absorber. This curve points to the field of maximum utility for hot carbonate, i.e., where acid-gas contents are great.

Actual Plant Data

To provide a general picture of the process, data from a operating plant are tabulated in Tables 1 and 2. The installation under particular consideration is similar to the basic carbonate unit shown in Fig. 1.

Steam is supplied to the regenerator reboiler from a vapor-phase engine cooling system. In this manner, the necessary reboil heat is obtained at very nearly no cost. Since the engines provide an excess, no steam-consumption data are presented.

TABLE 2—OPERATING DATA, HOT-POTASSIUM CARBONATE CARBON DIOXIDE-REMOVAL SYSTEM

	E-1	E-2	E-4	E-6	E-8	E-9	E-10	E-11
Material balance:								
Gas to contactor, M.c.f.d.	5,410	5,410	6,310	8,480	7,610	8,210	6,490	3,110
Contactor outlet, M.c.f.d.	5,212	5,195	6,065	8,191	7,365	7,952	6,273	2,959
CO_2 balance:								
CO_2 to plant, M.c.f.d.	411	422	485	654	785	632	500	243
CO_2 to stack, M.c.f.d.	198	215	245	289	245	258	217	151
Per cent absorbed	48.0	51.2	50.5	44.2	31.2	40.8	43.5	62.1
CO_2 analyses (obs. Orsat):								
Per cent inlet	7.6	7.8	7.8	7.7	7.7	7.7	7.7	7.8
Per cent contactor residue	4.15	....	4.1	4.4	3.8	4.7	4.3	3.2
Lean solution:								
Rate, g.p.m.	93.7	103.8	102.5	103.8	68.0	68.0	68.6	73.0
Specific gravity	1.285	1.250	1.250	1.262	1.245	1.278	1.292	1.26
P Alk. E.P. 0.1-N HCL/gm.	12.2	12.3	12.4	12.1	12.3	12.7	13.6	12.7
M Alk. E.P. 0.1-N HCL/gm.	40.6	40.2	39.6	39.2	39.9	41.4	44.7	40.5
Eq. K_2CO_3, per cent weight	28.0	27.7	27.3	27.0	27.5	28.5	30.8	28.0
Free K_2CO_3	16.8	17.0	17.1	16.7	17.0	17.5	18.7	17.5
$KHCO_3$ (as eq. K_2CO_3)	11.2	10.7	10.2	10.3	10.5	11.0	12.1	10.5
CO_2 in solution, cu. ft. per gal.	3.3	3.1	2.9	3.0	3.0	3.2	3.6	3.0
Rich solution:								
CO_2 in solution, cu. ft. per gal.	4.8	4.5	4.6	4.9	5.0	5.8	5.8	5.4
$KHCO_3$ (as eq. K_2CO_3), weight per cent	16.3	15.7	15.9	16.9	19.3	19.6	19.7	20.3
Per cent reacted	58.3	56.8	58.4	62.6	62.7	60.9	64.0	72.7
Contactor circulation:								
Water rate, moles per hour	2,400	2,620	2,610	2,630	1,700	1,700	1,700	1,835
Carbonate rate, moles per hour	122	133	139	129	86	91	100	95
Total	2,522	2,755	2,740	2,759	1,786	1,791	1,800	1,930
Gas rate, moles per hour	594	594	695	935	837	905	715	342
L/V	4.25	4.64	3.94	2.95	2.13	1.98	2.52	5.64

Gas-vapor contact is accomplished in a conventional absorber column containing perforated trays. Such trays are adequate for absorption and stripping and result in a substantial saving over the equivalent capacity in a packed column.

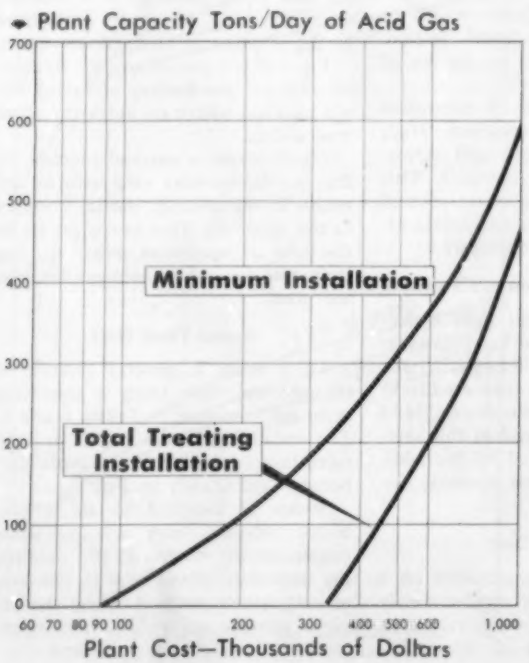
The unit was designed to remove 50% of the carbon dioxide from 8.5 M.M.s.c.f.d. to produce a residue containing 5% carbon dioxide. Operating conditions were varied so that from 48 to 95% of the carbon dioxide to the contactor was removed, giving a residue purity from 4.5 to 0.4% carbon dioxide.

System Equilibria

Batch equilibrium data concerning the reactions of acid gases with hot-potassium carbonate are readily available from the Bureau of Mines. Some private concerns, including Petrocon have also expended considerable effort in the accumulation of such data. Equilibrium data for carbon dioxide and hydrogen sulfide over a regenerated carbonate solution show that at normal operating temperatures (230° F.) hydrogen sulfide is more readily regenerated than carbon dioxide.

Fig. 9 shows the equivalent partial pressures of solution containing hydrogen sulfide and carbon dioxide in equal quantities.

Fig. 10 demonstrates the relative holding tendency of carbonate solutions of varying strength. This curve is based on data taken for hydrogen sulfide, but should be valid qualitatively for carbon dioxide.



ANALYSIS of plant costs by acid-gas capacity. Fig. 11.

Plant cost . . . Fig. 11 shows the spread between what we have termed a basic carbonate unit, where gas is delivered hot to the system, and is returned saturated with water vapor, and a total grass-roots treating unit to receive gas at ambient temperatures and deliver it to a pipeline, sweet and dry.

Operating costs . . . The most marked economy in the use of a carbonate system is with regard to operating costs. For example, operating costs involved in the purification to 1% 25 M.M.s.c.f.d. of natural gas containing 50, 25, and 2% acid gas respectively, with no capital depreciation charge, is estimated at $0.058, $0.029, and $0.013 per M.s.c.f. of treated gas. This charge includes the estimated fuel and utilities, water system, steam plant or heater, chemical costs and operating labor. Gas is priced at 12 cents per M.s.c.f., electric power at 1 cent per kw.-hr. and $120 per day for labor charges.

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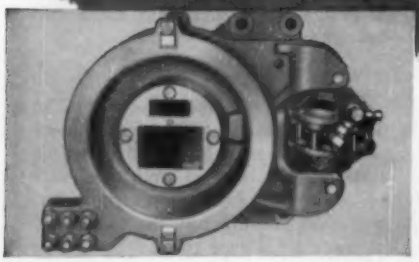

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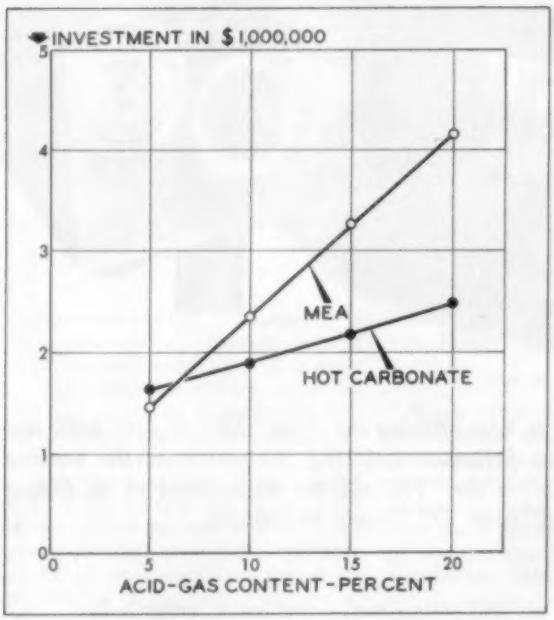
Here is a study on the economics of . . .

Acid-gas removal

by the hot-carbonate method

BY A. G. EICKMEYER



COMPARISON of investment for treating 100 M.M.c.f.d. by amine and by hot-carbonate methods, complete plant including utilities, 500-psig. absorption. Fig. 1.

TABLE 1—COST FOR TREATING 100 M.M.C.F.D. AT 500 PSIG.

Acid-gas content—	5%	10%	15%	20%
Acid-Gas Removal by Monoethanolamine				
Investment incl. utilities	$1,450,000	$2,360,000	$3,260,000	$4,150,000
Annual operating costs:				
Labor and supervision	$100,000	$100,000	$100,000	$100,000
Maintenance at 4% of capital	58,000	94,000	130,000	166,000
Fuel gas at 20 cents per million B.t.u.	206,000	412,000	618,000	824,000
Chemicals	20,000	25,000	30,000	35,000
Fixed charges at 16%	232,000	378,000	521,000	664,000
Total annual cost	$616,000	$1,009,000	$1,399,000	$1,789,000
Cost per M.c.f. gas treated, cents	1.76	2.88	4.00	5.11
Cost per M.c.f. acid gas, cents	35.2	28.8	26.4	25.6
Acid-Gas Removal by Hot Carbonate				
Investment incl. utilities	$1,600,000	$1,890,000	$2,180,000	$2,465,000
Annual operating costs:				
Labor and supervision	$100,000	$100,000	$100,000	$100,000
Maintenance at 4% of capital	64,000	75,000	87,000	98,000
Fuel gas at 20 cents per million B.t.u.	112,000	150,000	190,000	230,000
Chemicals	10,000	12,000	14,000	16,000
Fixed charges at 16%	256,000	303,000	348,000	395,000
Total annual cost	$542,000	$640,000	$739,000	$839,000
Cost per M.c.f. gas treated, cents	1.55	1.83	2.11	2.40
Cost per M.c.f. acid gas, cents	31.0	18.3	14.1	12.0

WHEN a high partial pressure of acid gas is available, the hot-carbonate process has important advantages over an amine process for acid-gas removal. For CO_2 removal, the process has been proven in a number of chemical plants and it can be recommended for B.t.u. improvement of a sweet natural gas.

With sour gas, at present, the corrosion problems are somewhat unknown. However, it is anticipated that in time these problems will be defined and resolved, as in the case of amine-treating plants. Furthermore, it is predicted that with improvements in design the process will come into widespread use.

Process Principle

The hot-carbonate process is so named because acid-gas components, such as carbon dioxide and hydrogen sulfide, are absorbed under pressure by a hot solution of potassium carbonate at substantially the same temperature as is used for a regeneration of the solution with steam at low pressure. A certain amount of bicarbonate ions are always present in the solution and in the absorption of carbon dioxide the reactions involve a shift toward a greater or lesser proportion of bicarbonate as the solution cycles between the absorption and the stripping steps. Similar reactions occur with the absorption of hydrogen sulfide, which is tied up as the hydro sulfide ion in solution.

Used in Petrochem

The process was developed through the pilot-plant stage by the U. S. Bureau of Mines.[1,2] and others. The goal was to achieve a more economic method for removal of large quantities of carbon dioxide from synthesis gas. The process is now used commercially in at least seven plants in the United States alone. So far, the major use has been in petrochemical plants, particularly ammonia plants where carbon dioxide, which is a poison to the catalyst, must be removed down to a few parts per million.

The author presented a preliminary draft of this paper before the 1958 Gas Conditioning Conference at the University of Oklahoma, Norman.

TABLE 2—HOT-CARBONATE PUMP EXPERIENCE

Plant—	Pump speed and stages	Materials and service: Case	Rotating elements	Wear rings	Remarks
PLANT MR					
Original circulation pumps	Two-stage centrifugal pump 857-ft. head at 564 g.p.m.	Cast iron	Cast iron impellers		Severe—Corrosion-erosion of impeller and casing after less than 100 hours of operation. Trace of hydrogen sulfide in gas.
Replacement pumps	Same pump with replacement parts	316 SS	316 SS impellers, 17 PH 7 shaft	316 SS Stellite hardened facings	
PLANT LR					
Original pumps	Vertically split, single-stage, double-suction pump, 3,550 r.p.m.	Cast steel	Cast iron—corroded after 3 weeks, changing to SS		Erosion-corrosion of cast-iron impeller. Packing with water purge. Some noise; possibly cavitation.
Spare ordered	Same pump	Type 304	Type 304		Spare not in service.
PLANT KL					
Original pumps	Two-stage, 3,600 r.p.m., 800-ft. head at 115 g.p.m.	Cast steel	Cast iron	Cast iron	Trace of sulfur in gas. Erosion-corrosion of cast-iron impeller and case after 4 weeks. Mechanical seal water purge.
Replacement pumps	Same pump	Type 316	Type 316	Type 316	All 316 pump on order; has not yet arrived. 410 impeller in present pumps appears satisfactory but insufficient service to be sure.
PLANT SB					
Original pumps	1,750 r.p.m., three-stage	Cast iron	Bronze impeller, 30 days		Poor suction head; cavitation. Corrosion at wear rings.
Replacements	Same pump	Cast carbon steel, 3 months	Carbon-steel 60 days		Wearing at interstage seals (erosion-corrosion).
Present equipment	Same pump with booster	3-4% nickel cast iron, 1 year to date	Type 316—no corrosion in 1 year	Carpenter alloy 20, 6 months	Installed six-stage vertical booster pump with mechanical seal. Continuous side-stream filter handles 5-10% of circulation. Maintain 3,000 p.p.m. corrosion inhibitor. Make up 100 lb. per week $K_2Cr_2O_7$ now required. Had been much less; system believed to be contaminated.
PLANT BW					
Original pumps	3,500 r.p.m., two-stage	Cast iron	304 SS	304 SS	Inadequate suction head; cavitation.
	3,500 r.p.m., two-stage	Cast iron	304 SS—3 months	304 SS	Inadequate suction head; cavitation.
Replacements	New pump	SS	SS	SS	Packing (no mechanical seals).
		SS	SS	SS	Packing.
PLANT WK					
Original pumps	3,550 r.p.m., two-stage	11-13% chrome	11-13% chrome	11-13% chrome	Rapid corrosion occurred when gas contained H_2S, which poisoned the dichromate inhibitor.
	3,550 r.p.m., single stage	11-13% chrome	11-13% chrome	11-13% chrome	
Replacements	Same pumps	Type 316, SS	4,340 shaft, 316 impeller, 316 sleeves	Stellite facing	
PLANT MP					
Original pumps	3,850 r.p.m., single stage	Cast steel	Copper free Ni-Resist (steel shaft)	11-13% chrome	Cavitation, general corrosion. Erosion-corrosion of impeller and case.
Booster pump (added)	1,750 r.p.m., single stage	4-6% chrome			

Ordinarily a sequence of two or three carbon dioxide removal steps are employed, with the initial bulk removal being accomplished by hot carbonate. The degree of cleanup designed for this step is dependent upon the nature of subsequent purification steps. The residual carbon dioxide from present hot-carbonate units varies all the way from 2 or 3% down to less than 0.2% CO_2.

However, the process could be designed for even better cleanup if desired. The process has not yet been used commercially for the removal of large quantities of hydrogen sulfide. A plant of this kind is now being constructed and is expected to be in operation this summer.

TABLE 3—REMOVAL OF CO_2 AND H_2S BY THE HOT-CARBONATE PROCESS

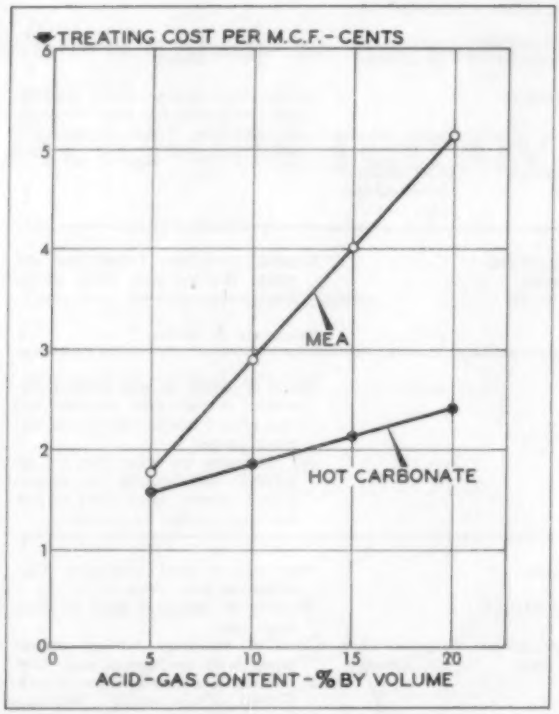
Run No.—	Per cent feed*: CO_2	H_2S	Per cent scrubbed: CO_2	H_2S	Split-stream temperature (°C.)	Carrying capacity (cu. ft./gal.)
126A	11.3	0.51	0.33	0.002 (20 p.p.m.)	91	3.4
126B	11.0	0.556	0.40	0.004	90	3.2
126C	10.9	0.578	0.34	0.004	90	3.2
127C	10.7	0.927	0.23	0.011	92	3.2
133A-2	11.5	4.4	0.1	0.01	72	1.75

*Feed gas at 300 psig.

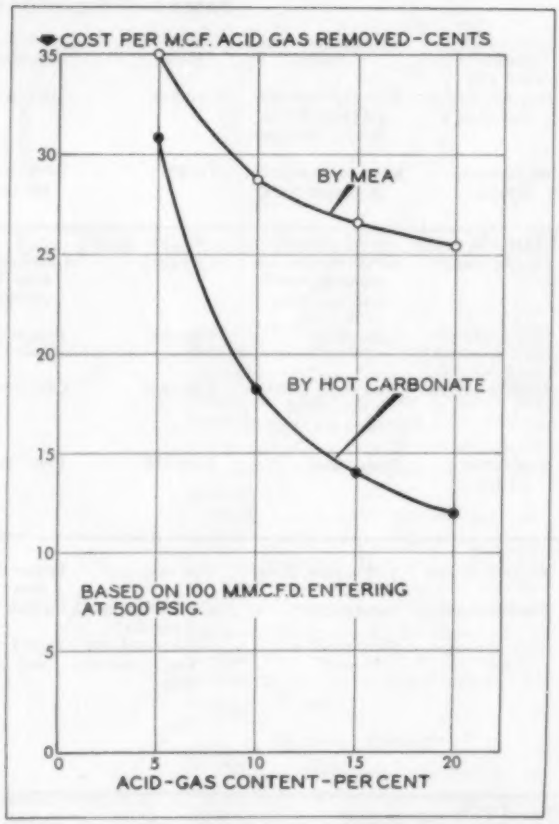
Note: Pilot-plant data by courtesy of the U. S. Bureau of Mines.

Economic Incentive

The primary incentive for the use of the hot-carbonate process is a matter of economics. Under favorable conditions of pressure and acid-gas content the initial investment and operating costs for hot-carbonate plants is considerably less than for an amine plant.



TREATING COSTS by amine and by hot-carbonate method. Based on 100 M.M.c.f.d. entering plant at 500 psig. Fig. 2.



COST of removing 1 M.c.f. acid gas by amine and by hot carbonate. Based on 100 M.M.c.f.d. entering at 500 psig. Fig. 3.

Why economies? . . . The main reason for the economies stem from the use of the hot circulating solution for absorption. Expensive heat exchangers are not required and less steam generation and cooling equipment is needed. Also, since lower level heat is required by the hot-carbonate process than is needed for amine regeneration, waste heat recovery is frequently practical. For example, it is possible to use low-pressure steam resulting from ebullient cooling of gas-engine drives or from recovery of waste heat from process streams.

What Are Limitations?

The limitations of the process revolve about the partial pressure of the acid gas and our present knowledge regarding corrosion problems. The process is not recommended for low-pressure absorption or high-pressure absorption of a low concentration of acid gas.

As a rule of thumb, when the partial pressure of acid gas is 20 psi. or greater, the hot-carbonate process should be considered. This may need to be modified somewhat by the size of the plant and the local cost for utilities. Regarding corrosion problems which will be outlined later, many of the troubles could have been circumvented by the initial design and selection of materials. From the standpoint of design, the process is much more complicated than it appears, and therefore know-how is very important.

Economic Studies

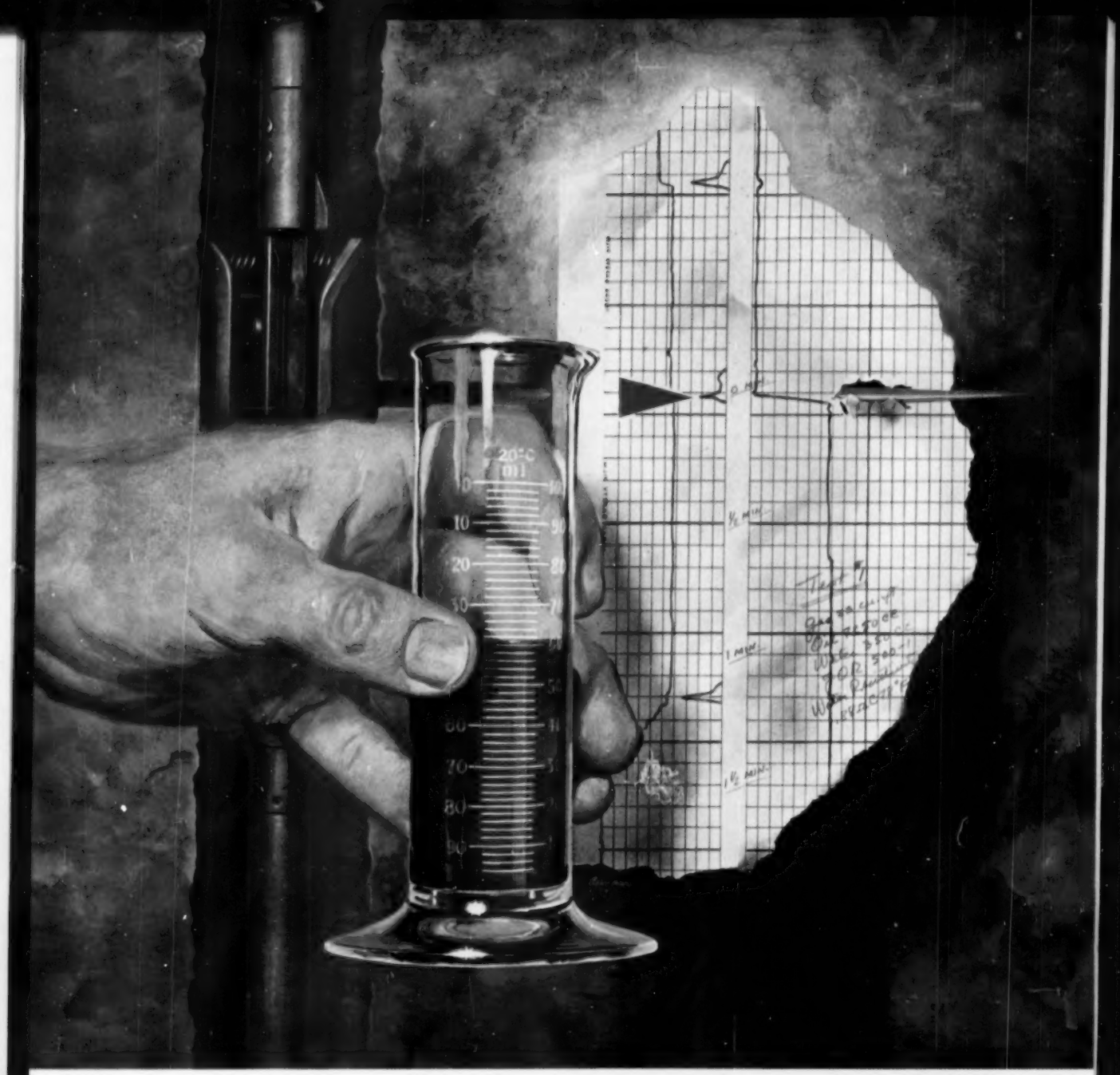
Economic studies by Mullowney[3] have indicated a preference for the hot-carbonate process for the bulk removal of carbon dioxide from synthesis gas containing 34% CO_2. Mullowney's flow sheets show the simple single-stage hot-carbonate cycle suitable for bulk removal with clean-up by other methods. Various modifications of this basic scheme are possible and the selection depends upon the degree of acid-gas removal desired.

Comparison basis . . . To permit a direct comparison, the following estimates for natural-gas treating are based on meeting the pipeline specification of 0.25 grain of sulfur per 100 cu. ft. Since the composition of natural gas varies considerably, it is of interest to compare the relative economics at various concentrations of acid-gas components. This has been done for both carbonate and monoethanolamine treating plants having a capacity of 100 M.M.c.f.d. of feed gas and an absorption pressure of 500 psig.

The amine plant designs were based on 15% MEA and a net loading of 0.3 mole acid gas per mole of amine, as generally recommended to avoid corrosion. This corresponds to 2.32 standard cu. ft. of acid gas per gallon of solution, and a solution circulation

About the author . . .

A. G. Eickmeyer is presently a process consultant in Kansas City, Mo. He has developed process improvements for seven operating hot-carbonate plants and designed the largest hot-carbonate unit in the United States. He has been with Pan American Petroleum Corp. as a process engineer, and later with J. F. Pritchard & Co. as a project engineer and assistant manager of the petroleum and chemical division. He entered the consulting-engineering field in the spring of 1957, specializing in gas processes and sulfur recovery.



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rate directly proportional to the acid-gas content. The hot-carbonate design was based on the use of 30% potassium carbonate solution and the loading varied from 2.1 to 4.2 cu. ft. per gal., depending upon the partial pressure of the acid gas.

Results of Economic Study

The results of the economic study are presented in Table 1 and Figs. 1, 2, and 3. As shown by Figs. 1 and 2, the costs for an amine plant increase sharply with the acid-gas content. This is due to limitation in loading in order to avoid corrosion, which in turn results in high circulation rates and high steam consumption. On the other hand, the hot-carbonate process uses the available pressure of acid gas more effectively. Hence the costs increase with acid-gas content at a much lower rate.

It should be noted that the two lines of Fig. 2 would intersect to give equal costs at about 4% acid gas, which for a total pressure of 500 psig. corresponds to a partial pressure of 20 psi.; the rule of thumb mentioned before. To illustrate the effect of different utilities requirements by the two processes, the investment figures of Table 1 are for a complete plant, including the steam generation and cooling system. However, plant site and housing for plant personnel are not included.

Corrosion Inhibitors

When carbon dioxide is the only acid-gas component to be removed, about 3,000 p.p.m. of potassium dichromate has proven to be a good corrosion inhibitor. However, two plants now operating on natural gas contain traces of hydrogen sulfide which react with the dichromate rendering it unsuitable.

A good corrosion inhibitor is needed for sour-gas service, and work is being done on this at present. Alternately we may find suitable materials of construction for this service.

Carbon steel . . . This is generally used for all the items of equipment except for certain critical locations such as the letdown valve, and the rotating elements of the pumps. At these points a stainless steel, such as Type 316, is ordinarily used.

Pump casings . . . The material requirements for the pump casings have been clouded in the experience to date by the frequent occurrence of cavitation, which should be avoided in the design and operation of the plant. For example, in the early operation of one plant, pumps had suffered from severe erosion - corrosion, and later, under more favorable conditions, the carbon-steel casings appeared to be satisfactory. The pump experience with a number of plants is summarized in Table 2.

Bureau of Mines Data

Some pilot-plant operations with a gas containing both carbon dioxide and hydrogen sulfide have been conducted by the Bureau of Mines. Data from several of the runs is shown in Table 3. The ratio of inlet to outlet concentration is generally several times greater for hydrogen sulfide than it is for CO_2. This is evidence of the fact that hydrogen sulfide is removed more rapidly than carbon dioxide. The reason for this is believed to be that CO_2 must first react with water in order to become an acid, while on the other hand H_2S is already an acid.

Scaling up . . . There have been problems of scaling up from pilot plant to commercial size and, in some cases, the full advantages of the process have not been realized. However, this is a matter of process design and equipment sizing. Although the finished process is quite simple, there are a number of design variables to be considered, such as the composition of the solution and of the gas, the absorption and the regeneration pressures, the temperature of absorption, the steam usage, the circulation rate, the diameter of the vessels, the number and type of trays or alternately the type and size of packing together with the height of packed beds.

With so many variables to be considered, the importance of the experience and ability of the designer is apparent. Furthermore, although the equipment is fixed when a plant is built, there are still a number of operating variables which are subject to change and frequently improved performance can be obtained at conditions which may differ from the design basis. However, what is optimum for one plant may not be for another since each plant is different and requires special consideration.

Since the solution is an electrolyte both the absorber and the regenerator vessels should be stress-relieved in order to avoid stress corrosion.

Note that Table 2 reflects difficulties with pump corrosion experienced during initial operation of some plants and could be attributed to one or more of the following causes: (1) unsuitable materials of construction; (2) poor suction conditions resulting in cavitation; (3) accumulation of solids in the solution due to inadequate filtration; and (4) harmful trace impurities.

Editor's note: More plants have gone on stream since this manuscript was prepared. There are now at least 11 plants in the United States employing this process.

Acknowledgment . . . Thanks are due clients and friends for permission to publish information on pump experience.

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2. "Improved Process for CO_2 Absorption Uses Hot-Carbonate Solution," H. E. Benson, J. H. Field, and W. P. Haynes, Chem. Engr. Prog., October 1956, pp. 433-438.

3. "Price Tags on Seven Methods of Removing CO_2 from High-CO_2-Content Gas," J. F. Mullowney, The Oil and Gas Journal, February 10, 1958, pp. 93-98.

Drippings caught by metal tray

IN THE SAN GABRIEL FIELD of Los Angeles County, California, Standard Oil Co. of California uses this pan to catch the drippings from the sucker rods and keep the derrick floor in a safer condition.

An innovation was made by placing two finger boards in the rig and standing the rods up rather than hanging them on hangers. This made it easier for the derrickman to unhook and stack the rods.

The pan was made by simply taking a piece of old tank iron and cutting out the corners and welding them up to make the vessel. A piece of 1-in. oak board is placed in the bottom to protect the threads of the rods.

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by WILLIAM H. MORRIS
President
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"Crude oil is a stubborn material. It clings so tenaciously to the porous rock formation in which it's found that in many cases more than half of the oil is not recovered by conventional production methods. Now, however, Sinclair research engineers have learned how to use an ancient tool—fire—to pry out additional quantities of the oil left behind. A patented Sinclair 'heatwave' process starts a fire in the oil formation. Then, injections of gaseous fuel and air drive the fire through that formation, sweeping the oil to producing wells. Now undergoing commercial testing, this Sinclair research development promises much fuller utilization of the nation's oil resources and demonstrates our continuing technical leadership."

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BY W. L. NELSON, Technical Editor and Petroleum Consultant

Cost of operating topping plants

TABLE 1—ELEMENTS OF OPERATING COSTS (TOPPING)

Element—	Unit (somewhat standard)	1956 unit cost	For 30,000 bbl. per day plant cents per bbl.	See Process Costimating No.
Labor:				
Supervision	0.2-0.67 men per 8-hour shift	$3.85 per hour*	0.19	26, 28, 42
Operating	1.3-4.33 men per 8-hour shift	$3.12 per hour*	1.00	26, 28, 42
Maintenance	3-5% per year of replacement	See Fig. 1	0.57	29
Fuel:				
20° API crude	70,000-90,000 B.t.u. per bbl.†	25-40 cents per M.M. B.t.u.	1.87-3.60	3, 4, 6
40° API crude	90,000-125,000 B.t.u. per bbl.†	25-40 cents per M.M. B.t.u.	(2.25-5.00)	3, 4, 6
Steam (process and burners):‡				
20° API crude	25-35 lb. per bbl.	45-60 cents per 1,000 lb.	1.12-2.10	17, 18
40° API crude	35-50 lb. per bbl.	45-60 cents per 1,000 lb.	(1.57-3.00)	17, 18
Power	0.0035-0.008 b.hp.-hr. per bbl.¶	5.0 cents per hp.-hr.§	0.42-0.96	13, 14, 21-23
Water:				
20° API crude	Half of heat developed (above)‖	1.7 cents per 1,000 gal.	0.24-0.31	15, 16
40° API crude	(30° F. rise)	(or per 250,000 B.t.u.)	(0.31-0.43)	15, 16
Chemicals	(Inhibitors, ammonia, etc.)		0-0.15	
Compression	(Tail gas handling usually charged to gas system)		.....	
Total direct cost (probable extremes)			6.2-10.3	
Obsolescence	1% per year of replacement	See Fig. 1	0.14	
Insurance and taxes	2% per year of replacement	See Fig. 1	0.29	
Interest or dividends	4% per year of replacement	See Fig. 1	0.57	
Laboratory overhead	0.3-0.5 men per 8-hour shift	$3.12 per hour*	0.10	26
Other possible indirect charges			1.1	

*Average U. S. wages plus only 15% for all burdens. Actual burden is 27% but the number of employes upon which average wages are based include some men who are on off-time.

†Heat generated—the heat absorbed is less by the efficiency of the heater.

‡Additional steam may be used for pumps (turbines) for part of the power shown here. The reuse of steam to a greater extent than the 20% used herein will reduce the cost of steam.

§Estimate of average of electrical (0.9 cent) and steam pumps (9 cents), per brake horsepower-hour.

¶Assuming a pumping efficiency of 70%. If all power requirements were considered as electrical power, the kilowatt-hours required would be 0.0029 to 0.0066 based on efficiency of 90%. In studying actual plants, each type of power generation should be handled separately.

‖Net heat added in the process plus condensing of the steam. This is often about equal to the heat generated.

ALTHOUGH topping or atmospheric distillation is one of the most simple operations, there are still many cost items. Somewhat standard limits on various cost elements are shown in Table 1, and Fig. 1 shows approximate construction costs and approximate limits of operating cost. Note that construction costs are based on 1946, so that they can be brought to current dates by means of the Nelson Construction Cost Index, but that operating costs are based on 1956 which is the basis of the operating cost series. The lowest operating costs shown in Fig. 1 result from the lowest ranges of each element but particularly to low fuel costs and to the processing of low-gravity (20° API) crude oils. In addition, small refiners use less labor and their maintenance costs represent a smaller proportion of replacement costs. It is obvious that actual operating costs can be builtup for a particular plant operating at any date. The Nelson Construction Cost Index appears in the first issue each month of The Oil and Gas Journal, and indexes for wages, productivity, fuel, and power appear each quarter (January, April, July, and October) on the Itemized Cost Indexes page of The Oil and Gas Journal.

The scant literature (mainly old) indicates higher costs (Fig. 1) than found here.

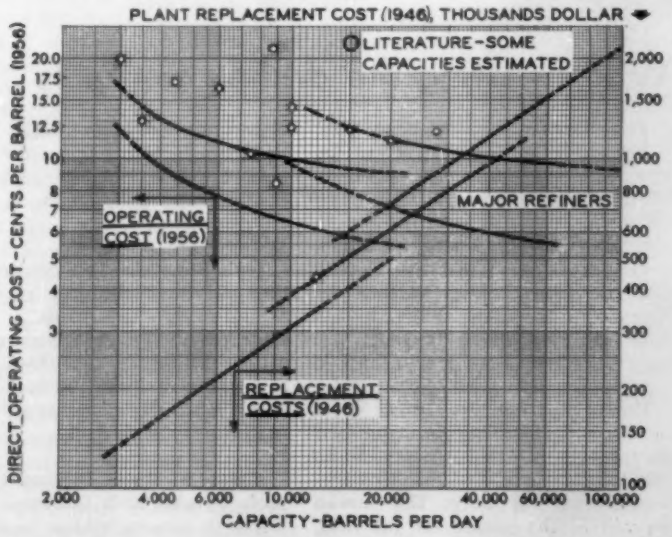

Fig. 1—Range of operating (1956) and investment (1946) costs for topping plants.

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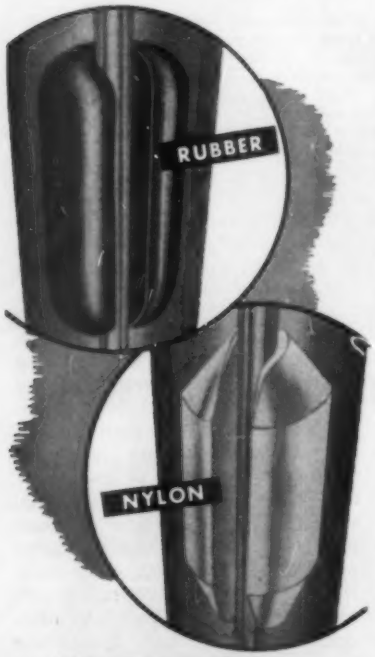

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New Pennsylvania-New York drilling record set by Texas-based contractor

A TEXAS-BASED contractor has set a new drilling-depth record in the Pennsylvanian-New York region.

The contractor, Delta Drilling Co., Tyler, Tex., is down to 12,415 ft. in an Oriskany gas well it has been drilling for New York State Natural Gas Corp. in Woodhull Township, in Steuben County, New York.

This is 72 ft. below the depth of the region's previous deepest well, in Sullivan County, Pennsylvania.

Delta, using one of its heavy-duty rotary rigs which has been operating in Pennsylvania and New York for some time, spudded the record-breaking well May 15. It drilled with air or gas to 11,993 ft. Below that depth, it switched to conventional drilling with mud.

The new rotary depth record is 1,270 ft. below the depth of the world's deepest cable-tool well which New York Natural drilled in Van Etten Township, in Chemung County, New York, in 1953.

Delta Drilling Co., headed by Joe Zeppa, has been active as a contractor and operating company in the Mid-Continent, southwestern, and Illinois basin areas for many years. More recently has been a pioneer in rotary drilling in Pennsylvania and New York.

Six-well program set for Texas' Hardin

DRILLING is getting under way on the first two of six wells Dutton Drilling Co., Houston, has contracted to put down in a multiwell exploratory program Ada Oil Co., also of Houston, is undertaking in northeastern Hardin County, in southeastern Texas.

The wells will test the Cockfield-Yegua section under 12,000 acres which Ada Oil Co. has under lease in that part of the county, and where it has carried on extensive geophysical operations over the past 2 years. The program calls for 7,500 to 8,000-ft. drilling.

Locations of the first two tests, being drilled simultaneously, are 12 miles apart. One, listed as 1-B Sternenber, is in the Hiram Barber Survey, 7 miles north of Kountze and 2 miles northeast of Dorsey field, nearest production. The other, 1 Kirkpatrick, is in the H&TC Survey 233, 6 miles southwest of Village Mills and about 4½ miles southwest of East Village Mills field, nearest production.

Locations for the other four tests are being surveyed. They are scheduled for drilling as rapidly as Dutton's rigs are available.

Who's getting the drilling contracts

Trigg Drilling Co., Oklahoma City, is drilling on a deep wildcat test for Powell Briscoe, Inc., of Oklahoma City, in Ellis County, far-western Oklahoma. Location is in the eastern part of the county, a little more than a mile from the Woodward County line, and about 3 miles southwest of Keenan, in the latter county. It is 3 miles south of the South Fargo gas area. A 10,300-ft. test is scheduled.

Rowan Drilling Co., Houston, is moving a deep-drilling rig to the new Magee field, in Smith County, South Mississippi, where it will drill for Arkansas Fuel Oil Corp. The Rowan rig will be the second for the field, opened by Arkansas Fuel in July with oil production from a 13,000-ft. Sligo sand. Rowan's job is southwest of the discovery well. **Marshall Young,** Brookhaven, Miss., contractor on the discovery well, is drilling Arkansas Fuel's second well, a location east of the discovery.

John Bunn has another deep wildcat operation scheduled for C. C. Winn in Maverick County, in far-southwestern Texas. Winn's new location, calling for a 6,000-ft. test, is at 1 Mangum Estate, in Section 106, Block 7, I&GN Survey. It is 14 miles northeast of Eagle Pass.

Great Northern Drilling Co. has taken on a 6,600-ft. Devonian drilling job at a remote wildcat location in Stillwater County, southern Montana. It is for Shoreline Petroleum Co., of San Antonio, Tex., whose location is

on government land, in 3-4s-15e. Location is on the Stillwater structure flanking the east front of the Beartooth Mountain Range.

Prince-Marine Drilling Co., Houston, has scheduled a deep test for Southwest Gas Producing Co. in the North Starks area, southern Beauregard Parish, southwestern Louisiana. Location is at 1 Nichols, in 36-7s-13w. Drilling permit is for a 13,500-ft. test.

South States Drilling Co., Longview, Tex., is on a new contract job 6 miles south of Henderson, in Rusk County, East Texas. It is a 7,800-ft. Travis Peak wildcat test for John C. Robbins, Jr., and F. R. Jackson, of Longview. Location is for 1 Gary, in the John Piburn Survey.

Jordan Drilling Co., Kilgore, Tex., is starting a 5,300-ft. Woodbine test in southeastern Freestone County, East Texas, as a joint operation with Ralph Spence, of Tyler, Tex. Location, at 1 Hale, in the Jose Maria Sanchez Survey, is about 2½ miles northwest of Oakwood, and about 5½ miles south of Butler.

Gilger Drilling Co., Houston, has a new deep wildcat operation east of Houma, in western Lafourche Parish, southeastern Louisiana. It is a contract job for Austral Oil Exploration Co. at 1 Waterford. Location is about 3 miles north of the North Bourg area and 4 miles east of Willow Woods field. Austral plans a 13,500-ft. test.

William H. Martin Drilling Co., Corpus Christi, has a new contract operation in the Orcones area, 7 miles southeast of Benavides, in southeastern Duval County, Southwest Texas. It is a 6,550-ft. test for Blair-Vreeland at 1-C Atlee Parr. Location is about ¾ mile from production.

Jett Drilling Co., Shreveport, La., has taken a deep contract job in Greene County, southeastern Mississippi. It is a proposed 13,500- ft. test for King Petroleum Co., of Los Angeles, whose location, at 1 Neely-Jackson, in 35-3n-8w, is 7 miles northeast of McLain, in the southwestern part of the county.

Dorris Ballew, Inc., Natchez, Miss., has a new contract operation in the recently extended area of Clayton field, 3½ miles southeast of Clayton, in Concordia Parish, eastern Louisiana. It is drilling for R. A. Campbell, independent operator, Vidalia, La. The new test is Campbell's 2-A Turner, in 56-8n-10e.

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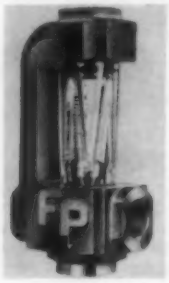

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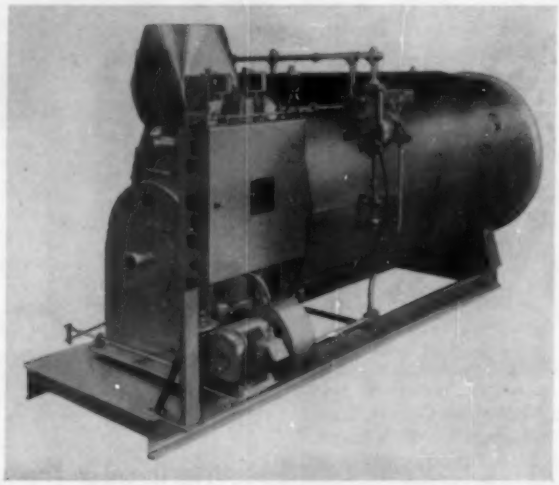


Boiler available in three sizes

. . . rated at 80, 100, and 125 hp. Quiet in operation, the boiler is equipped for gas firing. But it can be provided with an oil burner or with combination gas/oil burners.

The boiler comes as a packaged unit, ready to hook up. Automatic control of the firing cycle minimizes supervision required. A high-voltage spark ignites the gas pilot and burner, maintaining fire until desired pressure is reached. At this point, the boiler resumes a low-firing stage or shuts off. Automatic shutoff is provided for flame failure or low water.

Feed-water impurities settle in the sludge area where they will not bake onto heated surfaces. They can be removed by blowoff or by pushing the sludge out of boiler shell through the blowoff opening. **Write or call: Eclipse Fuel Engineering Co., Rockford, Ill., for details on WP boilers.**

●

Well tester speeds production check

. . . by giving an accurate determination of the production of crude oil from a well. Using an intermittent-sampling technique, it collects a series of samples in a small container at definite, equal intervals during the production test.

The Lambert well tester does this

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of September 22, 1958

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

mechanically by using the motion of the pumping unit. By use of a selectable ratchet ratio, the well tester will sample the crude production at equal intervals, directing the sampled fluid into a small container. At the end of the test, the volume of the accumulated sample is measured and then multiplied by the sampling ratio as set by the operator to give the total volume produced during the test period. **Write or call: Lambert Engineering Co., Inc., Box 1675, Borger, Tex., for details on well tester.**

●

New water additive stops scale

. . . formation in cooling systems and industrial and automotive radiators by rendering water nonscale-forming, according to the maker. Called KM-25, the material forms a monomolecular film over metal surfaces to eliminate and prevent scale, corrosion, and electrolysis. It does not interfere with heat transfer. **Write or call: Kool-Master Engineering Co., Odessa, Tex., for details on KM-25 water additive.**

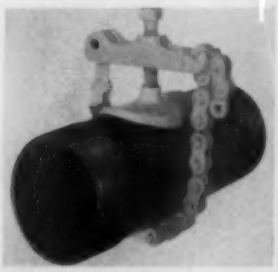
●

Additive cuts fracturing-fluid loss

. . . into permeable zones and helps provide increased production from better fractures, the maker reports. The product, designated FL-2, can be placed in any relatively water-free fracturing fluid.

Laboratory tests show it provides an effective temporary sealoff without appreciably affecting the backflow permeability. **Write or call: Halliburton Oil Well Cementing Co., Duncan, Okla., for details on FL-2 fluid-loss additive.**

●



New tool stops pipe leaks

. . . quickly and permanently. The tool and patches are accurately shaped to fit the pipe. Gaskets of neoprene and asbestos are available. It can be used on lines carrying oil, gas, steam, water, or chemicals.

Two types are available—saddle and chain. The saddle type comes in sizes of ¾ through 6 in.; the chain type, 6½ through 54 in.

The patch can be welded to the pipe, or the clamp can be left on. If welding can't be done, a cold-weld process is available to safely and permanently weld the patch to the pipe. **Write or call: Permanent Pipe Patch, Inc., P. O. Box 6244, Houston, for details on new pipe-leak repair tools.**

●

Gasoline additive retards gum

. . . formation and insoluble residues on surfaces containing copper, and thus promotes gasoline stability.

Identified only by experimental number PL-297, the new product is expected to find widespread use as an additive for gasolines used in vehicles which are stored for extensive periods, in marine fuels, and other applications where gasolines are in contact with large areas of copper or subjected to unusually severe oxidation conditions.

It also may be of value in fuel oils, certain types of lubricating oils, and other hydrocarbons where it is desirable to eliminate harmful catalytic effects of copper or copper-bearing alloys. **Write or call: E. I. du Pont de Nemours & Co., 8531 Nemours Building, Wilmington, Del., for details on PL-279 gasoline additive.**

COOLING TOWER INSTALLATION

In the typical cooling tower installation shown above, the motor — outside the humid or corrosive atmosphere — is connected by a floating-shaft coupling to the gear box under the large slow-speed, horizontal-blade fan.

REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

Thomas Couplings are used to advantage on Pumps, Compressors, Cooling Towers, Rigs or any other tough job where continuous operation and dependability are required.

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

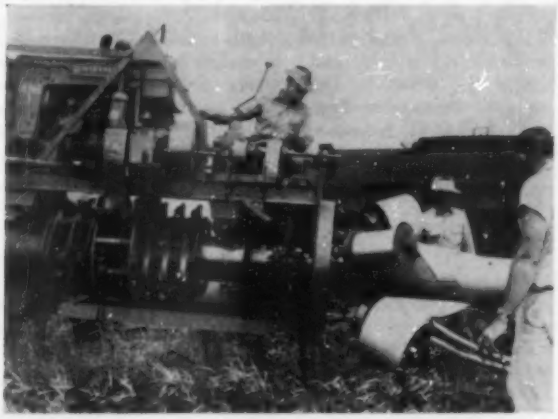
Write for Engineering Catalog 51A

THOMAS

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

SHOWCASE . . .

New Equipment

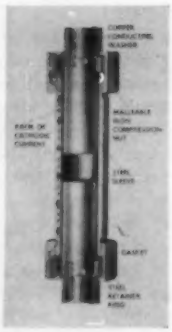


Machine cleans, coats, wraps pipe

. . . simultaneously. This new CRC line-traveling machine has been used on pipelines where a hot innercoat of microcrystalline wax, which requires no primer, was applied after the pipe was cleaned.

The hot wax is sprayed and flooded directly onto the pipe immediately after the cleaning operation. It is then wrapped with a plastic wrapper. The pipe can be lowered directly into the ditch immediately after it is cleaned, coated, and wrapped.

The combination machine is expected to be valuable because it eliminates the need for extra tractors and pipe-cradling gangs. The machine comes in sizes to handle 3 through 36-in. pipe, and larger if desired. **Write or call Crutcher-Rolfs-Cummings, Inc., P. O. Box 2073, Houston, for details on cleaning, coating, and wrapping machine.**

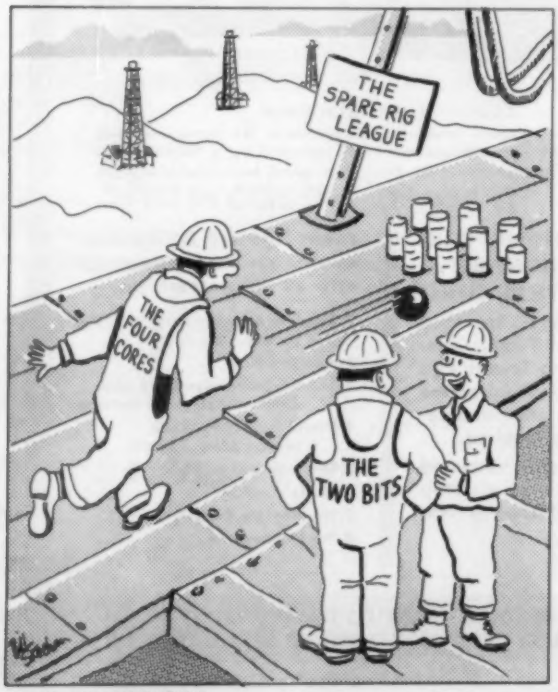


Compression pipe coupling

. . . conducts electricity and provides a low-resistance electrical joint for cathodic-protection systems. The coupling assures a sealed-in bond when the compression nuts are tightened, the maker claims.

It's simple to install and fully reusable. It eliminates thread cutting and close fitting of pipe.

The coupling does not heat up or cause deterioration of the gasket material. Sizes are available from ½ to 2 in. in a variety of metals and gasket materials to meet requirements for pipelines carrying water, oil, gas, or chemicals. **Write or call: Joslyn Mfg. and Supply Co., Wm. E. Pratt Foundry Div., 166 North Wacker Drive, Chicago, for details on pipe coupling.**



THE OIL AND GAS JOURNAL

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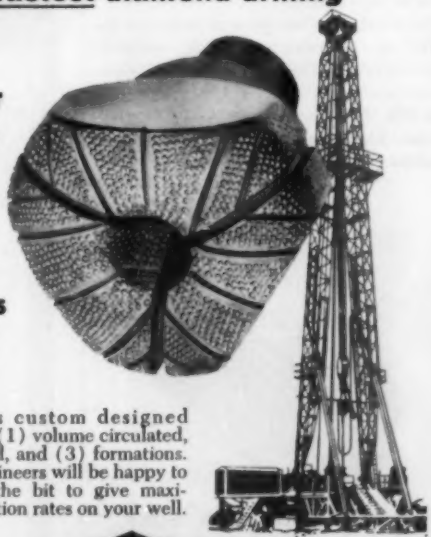
Plan your D&S Bit Program to Fit these Conditions



Each bit is custom designed according to (1) volume circulated, (2) type mud, and (3) formations. Our sales engineers will be happy to recommend the bit to give maximum penetration rates on your well.

TRUCO DIAMOND BITS

Drilling & Service INC.

DIAMOND DRILLING EQUIPMENT

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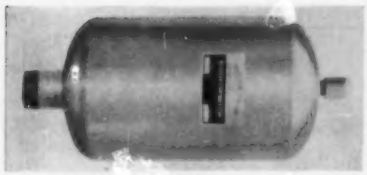
OFFICES IN ALL PRINCIPAL OIL AREAS

Ultra Fine Diamond Equipment for the Oilfield



Trap smooths pressure surges

. . . following closure of quick-acting valves in liquid lines. The new Pulsco shock trap promises to eliminate damage to lines and meters from high-pressure surges by limiting them to 1½ times line pressure.

An internal stainless-steel bellows factory-charged with nitrogen absorbs the pressure surges. The trap comes with working pressures to 3,000 psi. in sizes from 1½ to 4 in. with threaded connections. **Write or call: Pulsation Controls Corp., P. O. Box 169, Santa Paula, Calif., for details on shock trap.**

•

Tank valve adapter ups safety

. . . when used with a Vapor Recovery Systems prime water drawoff valve. The secondary valve adapter permits removal of the prime valve without loss of tank contents. It provides extra safety should one valve develop a leak.

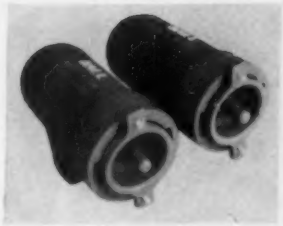
Features of the Fig. 300 valve adapter include replaceable, synthetic-rubber, O-ring plug inserts. If the synthetic insert fails, the valve is arranged so a metal-to-metal valve contact results until repairs are made. Steel or bronze valve bodies with either bronze or stainless steel are available. **Write or call: Vapor Recovery Systems Co., 2820 North Alameda Street, Compton, Calif., for details on secondary valve adapter.**

•

Lightweight bellows is available

. . . produced without a drawing or forming operation. The bellows, when machined from various aluminum alloys, is particulary suited where weight savings are important. Where high-temperature applications are involved, the bellows can be had in Inconel-X, A-286, and other high-temperature and high-strength alloys. Wall thickness can be controlled to give thickness or strength where stress is greatest.

Bellows with rated pressures of over 3,000 psi. are available with diameters from ¼ to 60 in. **Write or call: Hydrodyne Corp., 7350 Coldwater Canyon, North Hollywood, Calif., for Hydrodyne Bellows Bulletin.**



Dampener smooths mud-pump pulses

. . . and increases pump efficiency, regardless of pump size or type, the maker claims. It can be permanently mounted on the pump in place of the usual air chamber.

Pumps equipped with the Type AD unit can be compounded or operated in parallel. A precharged battery assembly is used. It can quickly be inserted into the dampener body by one man using only a hammer and ordinary wrenches.

Small pumps require only one unit. Larger ones use double or triple units. The bladder is of synthetic rubber and precharged with nitrogen. The body is of cast-alloy steel and constructed to take rough handling. **Write or call: Ball Mfg. Co., P. O. Box 2275, Torrance, Calif., for details on Type AD pulsation dampener.**

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When you need it!

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Carbon steel—bars, structurals, plates, sheets, tubing, etc.
Stainless—pipe, tubing, sheets, plates, bars, etc.
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Services—fast, accurate processing—sawing, shearing, slitting and flame-cutting . . . any shape, any size, any quantity.

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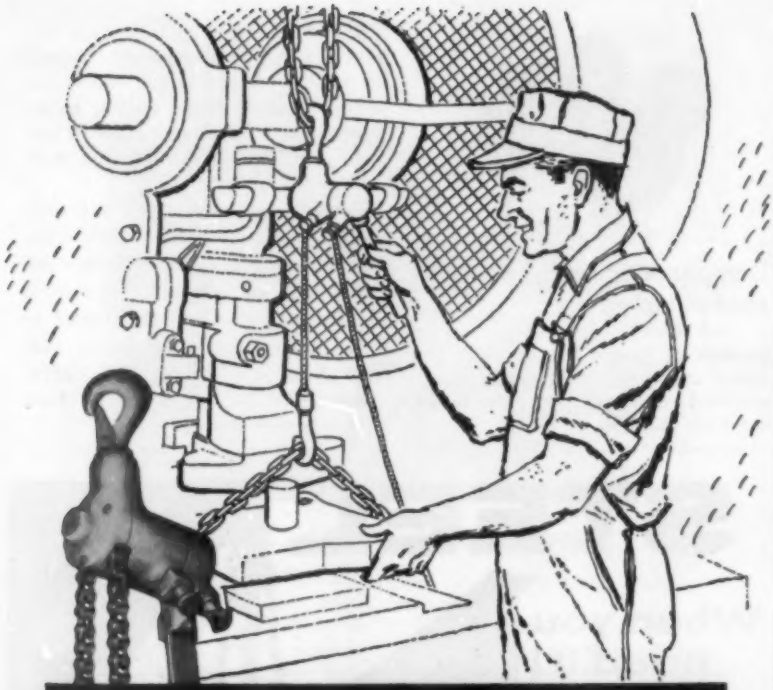

STRONG, COMPACT AND LIGHTWEIGHT

The Coffing Mighty Midget Puller

Compact and lightweight, the Coffing Mighty Midget Pullers are handy lifting tools for all types of industries. The 1000 lb. capacity model weighs but 9¼ lbs. and requires only 40 lbs. of handle pull. The 500 lb. model weighs 6½ lbs. and requires only a 28 lb. pull for full rated capacity.

The handle can be operated as a crank for fast lifting, or it can be used as a lever for short pulls, or for working in cramped quarters. Should the puller be overloaded, the "safety valve" handle will give before any load bearing part fails.

For full information on this compact, light and inexpensive lifting tool, consult your favorite supply store, or write for Bulletin MP.

COFFING HOIST

DIVISION OF

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COFFING HOISTS
Ratchet Lever
Spur Gear, Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet, Screw,
Hydraulic, Worm Gear

SHOWCASE . . .

New Literature

Flexible coupling Bulletin 10100A

. . .includes 10 sizes of couplings. Additions in sizes described are: No. 3 (⅜ to ¾-in. bore), No. 4 (½ to 1-in. bore), No. 11 (1⅞ to 2⅝-in. bore), and No. 12 (2⅜ to 2⅞-in. bore). Selection data and other engineering tables in the eight-page bulletin have been revised to include these large and small coupling sizes. The revised tables also include newly designed couplings with ductile-iron flanges and a special steel retaining ring and specially balanced couplings. Both new types are available in sizes from No. 5 through 12. **Write or call: T. B. Wood's Sons Co., Chambersburg, Pa., for Bulletin 10100A.**

Wire rope will last longer

. . . by proper lubrication and safe storage, and new Bulletin 103 shows how it's done. The bulletin notes that a rope, being composed of moving parts when in use, should be lubricated for the same reason that a machine is lubricated. Information includes abrasive wear, types of lubricants, acid-fumes resistance, rope construction, body, coating, weight, cleaning, and lubricant application. **Write or call: Leschen Wire Rope Div., H. K. Porter Co., Inc., 2727 Hamilton Avenue, St. Louis 12, for Bulletin 103.**

Bypass Rotameter types

. . . are described by the maker in a new four-page bulletin now accessible. The Rotameters measure fluid rate of flow in 2 in. pipelines and larger. They are applicable to both liquids and gases. A complete Bypass Rotameter installation is described. The bulletin also shows simple instructions for determining the permanent pressure loss across the main orifice, and the required straight run of pipe before and after the main orifice. **Write or call: Dept. M-I, Schutte & Koerting Co., Cornwells Heights, Bucks County, Penn., for Bulletin 18B.**

Flow control valve

. . . for gas or liquid is detailed in new Bulletin 358. The design is simple, and the valve has a sturdy construction. Each working part, except the cast-steel body, is made from stainless steel. A Teflon sleeve packing gland gives a tight seal requiring no lubrication. **Write or call: Merla Tool Corp., P. O. Box 2576, Dallas, for Bulletin 358.**

Solving piping flexibility problems

. . . is the topic discussed in new eight-page Bulletin 28A. It illustrates applications of swing joints, flexible ball joints, and flexible strut joints. Photographs and diagrams illustrate solutions to many problems regarding the handling of thermal expansion in permanent piping installations. They also illustrate handling of hot asphalt or tank-car and truck-loading lines. It covers the use of flexible strut joints in the construction of refinery towers, stacks, and large piping installations. Ball joints, used to provide flexibility or give to piping due to expansion or contraction, are illustrated in use with several examples. **Write or call: Barco Mfg. Co., Dept. J 24, 500 North Hough Street, Barrington, Ill., for Bulletin 28A.**

PVC pipe selection, application

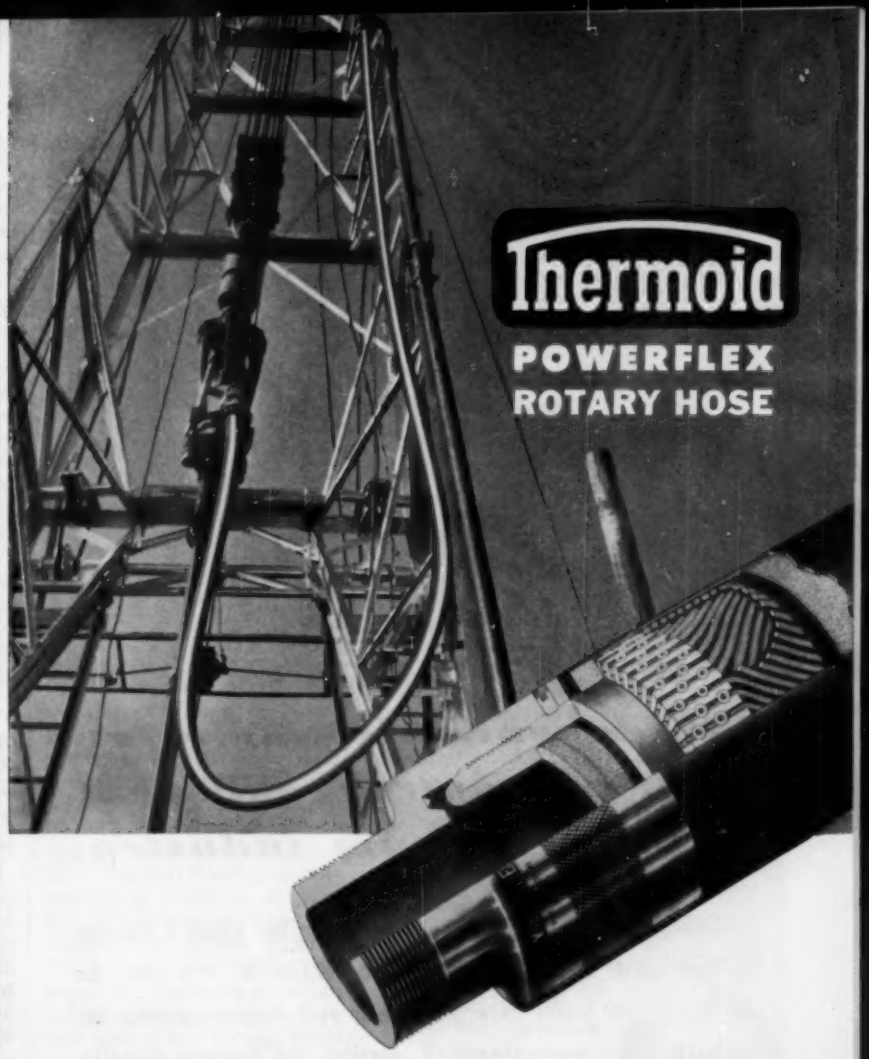
. . . reference manual is now available. The 16-page brochure informs the reader regarding the selection and application of polyvinyl chloride pipe, tubings, and fittings. Included is information on the maker's new weight-saving Schedule 40, 80, and 120 PVC fittings. The brochure also contains: (1) tables of corrosion resistance to several hundred common chemicals; table of recommended support spacing, (2) charts of thermal expansion and of head loss vs. flow rate; charts of working pressure and tensile strength vs. temperature, (3) detailed information, and (4) photos and other illustrations. **Write or call: Carlon Products Corp., 10225 Meech Avenue, Cleveland, for Bulletin PVC-100.**

Rotary rock-bit catalog

. . . includes descriptions of all Varel rock-bit types and the formations they are designed to drill. A new three-cone bit that's 2-15/16 in. in diameter is included in the three-cone line with sizes up to 20 in. The two-cone bits described are made in sizes ranging from 2⅜ through 9 in. Exploration and geophysical bits include two and three-cone rotary bits, blade bits, and cemented carbide inserted bits. Drill pipe, tubing, and tool joints for slim-hole drilling and workover rigs are described. **Write or call: Varel Mfg. Co., 9230 Denton Drive, Dallas, for Rotary Rock Bit Catalog.**

Drillable packers recovered

. . . safely by a new tool—the Packer Retriever—which is explained in a new four-page leaflet. The folder covers the tool's uses and advantages, with illustrations of the Retriever in a



"tops with tool pushers"

Tool pushers know from experience that *Powerflex* Rotary Hose is built for rugged oil field service. The *patented Full-Flow coupling* cannot leak or pull off for the life of the hose. Made of forged steel, it is an integral part of the cable assembly. Both the Neoprene tube and the cover are oil and abrasion resistant and reinforced with impregnated multi-ply woven fabric. *Every length is pre-tested to 5000 psi* . . . exceeds all ASI requirements.

Order Thermoid Hose, Multi-V Belts and Brake Blocks—for all oil field applications, from your nearest supply store or Thermoid Warehouse.

For rugged oil field service, always specify Thermoid Brake Blocks.

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Nelson Class 497 Steel Switchrack with Explosion-Proof Network Protectors, Current Limiters, and Weatherproof Bus Duct installed at a Petroleum Refinery in Class 1, Group D, Division 2, hazardous location.

THE *dependable name for electrical control equipment in the petroleum industry.*

When control equipment is specified for Class 1, Group D, hazardous locations investigate NELSON . . . first. Be guided by 20 years of engineering and manufacturing experience that assures you of getting the highest quality, easiest installed electrical equipment.

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Among the explosion-proof products designed for Class 1, Group D, hazardous locations manufactured by NELSON are:

- CIRCUIT BREAKERS
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- PIPE LINE SAMPLERS
- SWITCHRACKS
- MOTOR STARTERS
- CONTROL and TRANSFER SWITCHES
- JUNCTION BOXES
- HIGH-VOLTAGE MOTOR STARTERS

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

step-by-step operation. Sectional drawings, along with complete instructions for release and resetting procedure are included. **Write or call: Bowen Itco, Inc., P. O. Box 4587, Houston 13, for Packer Retriever bulletin.**

Valve information plentiful

. . . in four new bulletins now available. A flick of the wrist will open or close any of these valves, the maker reports, and he points out this claim with illustrative diagrams in eight-page Bulletin G-4. Bulletin W-7-A contains the features of solenoid valves along with dimensions and parts lists. Valve technical information, installation, construction, and specifications are outlined in eight-page Bulletin W8-A. Bulletin W-11 is concerned with rubber-lined valves for use in chemical plants. Operation and adjustment processes are included. **Write or call: Golden Anderson Valve Specialty Co., 1232 Ridge Avenue, Pittsburgh 33, Pa., for any or all of the aforementioned bulletins: G-4, W-7-A, W8-A, or W-11.**

Portable gas compressors

. . . and hydraulic oil-well pumps are described in a pair of new four-page folders. Photos and specifications help point out machinery operations throughout the Portable Compressor Bulletin 101. The advantages of hydraulic pumping units are shown in Bulletin 102. Specifications, production information, construction features, and flow diagrams are also included. **Write or call: Santa Fe Springs Manufacturing Co., 11925 East Florence Avenue, Santa Fe Springs, Calif., for Portable Compressor Bulletin 101 and/or Four-Foot Hydraulic Pumping Unit Bulletin 102.**

Through-conduit gate valve

. . . for wellheads is described in a new four-page bulletin now available. General description, installation process, and specifications are included. **Write or call: Triangle Valve Co., Ltd., Lamberhead Green, Wigan, England, for Through Conduit Wellhead Gate Valve bulletin.**

Guides to Well Stimulation

. . . is the name of a new eight-page reference folder now available. The booklet contains color reprints of various recommendations. These include basic fracturing treatments and examples of successful acidizing treatments. **Write or call: Dowell, division of The Dow Chemical Co., P. O. Box 536, Tulsa, for Well Stimulation Bulletin.**

Lufkin Foundry announces

. . . the opening of an office at Sterling, Colo., with E. H. Nixon, Jr., as local manager, according to L. A. Little, vice president and sales manager for Lufkin Foundry & Machine Co. Sales and service for the Julesburg basin area will be handled from this office. Also announced is the appointment of Jack Jumper, Jr., as eastern

E. H. Nixon, Jr.

Jack Jumper, Jr.

Venezuela district manager at Anaco, Ven., for Lufkin Foundry & Machine Co. International. A warehouse and a district sales office will be maintained at Anaco. Both will be under Jumper's direction.

Planes, Inc., announces

. . . that its facility at Houston International Airport is now the headquarters for the Aero Commander in the South Texas area. The Houston firm became a distributor for Aero Design & Engineering Co.'s Alti-Cruiser and Aero Commanders recently. It will license dealers at airports in Austin, San Antonio, and Corpus Christi. W. H. Harris is manager of Planes.

T. G. Gilbert named

. . . manager of the Canadian operation of Electro-Technical Labs with headquarters in Calgary, Alta., according to P. C. Sundt, Houston, general manager. Gilbert formerly was a sales engineer in Houston. He joined Electro-Technical Labs in 1955 after having acquired experience in the geophysical field.

New laboratory facilities and executive offices

. . . for Petroleum Technologists, Inc., will be established in October in this 10,600-sq. ft. building in Dallas, Tex. Long-term lease of the laboratory facilities, now under construction, has been announced by Dr. Norris Johnston, Petrotech president. Manager of the Dallas laboratory is Harold S. Deyo.

Mission announces changes

. . . in its oil field sales and service divisions of Mission Manufacturing Co. In the service field, Tony Volotko was named service engineer in Houston. He was a field sales representative there. Moving to New Iberia, La., from Houma, La., as field sales representative is Harold Herrin, formerly service engineer in Houma. Joe Scalise was reassigned from New Iberia to Houston as a field salesman. Appointed city sales representative for the Dallas-Fort Worth area with headquarters in Dallas is R. E. Hardy. A. E. Robinson transfers from Abilene, Tex., to New Orleans. R. M. Wood shifts from Illinois to Oklahoma City. Replacing Wood in Illinois as field sales representative for the tri-state area is Joe Young, formerly in Oklahoma City.

Robert C. Adams to head

. . . sales promotion activities for Union Tank Division with headquarters in Houston. He joined Union Tank Division of Butler Manufacturing Co. in 1953. He previously served with Marley Co. Union Tank is a manufacturer and distributor of oil and gas separators, heaters, treaters, and flow and storage tanks.

John H. Chandler named

. . . materials control supervisor for Alco Products, Inc.'s petroleum industry equipment division. He will headquarter in Beaumont, Tex. He has been with Alco for 16 years. In his new post, he will have responsibility for all requisitioning, stocking, and disbursing for the Beaumont plant.

H. F. Nostrand appointed

. . . advertising manager of W. C. Norris, Manufacturer, Division of Dover Corp., Tulsa, according to W. L. Butler, president. Nostrand, who has been with Norris since 1946, will serve under G. W. Davidson, Jr., vice president, sales, under whose jurisdiction the advertising department functions.

H. F. Nostrand

R. M. Breckenridge transfers

. . . from sales representative in the St. Louis sales district to sales representative of the Houston district, according to F. O. Hess, president, Selas Corp. of America. The Houston sales district has been increased to include the states of Louisiana, Oklahoma, and Texas. Breckenridge joined Selas in 1947 as a design engineer. He formerly was with Stoke & Smith Co. and Budd Co., both of Philadelphia.

Strom Steel Ball Co. occupies this new plant

. . . and office building in Erwin, Tenn. The 40-year-old company recently moved its plant and general offices from Cicero, Ill.

Goble and Hopkins join

. . . Hudson-Rush Co. R. Mack Goble goes to the Shreveport, La., office to assist Morley Hudson, president, with sales and application engineering. Wally Hopkins has associated with Jack Rush, vice president, in the Dallas, Tex., office. Goble was formerly with the industrial division, Minneapolis-Honeywell Regulator Co.

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Los Angeles, Calif.
Welding Caps—Dished & Flanged Heads.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

in El Paso, Tex., and Shreveport. Hopkins has had experience with boilers, burners, and combustion controls.

J. T. Calnon named

. . . president of Cummins Sales & Service, Inc. He was formerly vice president, sales. Ken W. Davis, formerly president, has been elected chairman of the board. Named vice president and general manager was L. J. Troutz, formerly general service manager. Calnon began his service with Cummins Sales & Service in 1945. Troutz is vice president of Cummins Sales & Service de Venezuela, C. A.

J. T. Calnon

Larkin Packer Co. adds

. . . Kenneth H. Eggers, vice president of St. Louis Union Trust Co., to its board of directors. He replaces T. S. McPheeters. Eggers is in charge of the business service division of St. Louis Union Trust. His company is a trustee for a portion of Larkin stock. He is a director of Sanger Investment Co. of Dallas, Tex., and Medical Arts Building Co. in Houston.

Edward H. Glascock joins

. . . the diesel engine division of White Motor Co. as sales representative in the New Orleans region, which includes Louisiana, southern Arkansas, Mississippi, and Alabama. He will be responsible for sales to the oil-field, marine, and industrial markets and at the service of area consulting engineers.

John O. Campbell appointed

. . . Chicago area sales manager for Westinghouse Electric Corp.'s apparatus division, according to C. V. Roseberry, vice president in charge of the midwestern region. Campbell formerly was distribution apparatus manager of the Central region with headquarters in Pittsburgh, Pa. He joined Westinghouse in 1946.

Parsons Co. appoints

. . . Texas Machinery & Equipment Co., Inc., Amarillo, Tex., as exclusive distributor for western Texas. The complete range of models of the "Trenchliner" will be handled by the new dealer, according to R. E. Bansemer, Parsons sales manager. President of Texas Machinery & Equipment is Charles D. Lutz, Jr. W. B. Hale is vice president and sales manager.

Stan Bobowski named

. . . zone sales manager for Motorola Communications & Electronics, Inc., in the Panhandle area. He has been the communications representative in this area. He will handle the sale of two-way radio and other industrial electronic equipment to industry.

Bowen ITCO, Inc., purchases

. . . S. R. Bowen Co. of Santa Fe Springs, Calif., according to Fred N. Osmun, president of Bowen ITCO. Bowen ITCO took over the S. R. Bowen operations immediately, providing uninterrupted service to customers and agents of both companies.

C. A. Thomas named president

. . . of Stratoflex, Inc., according to Ken W. Davis, former president and now chairman of the board. John Tullis, formerly with Unit Rig & Equipment Co., is the new vice president and general manager. W. E. Strittmatter is secretary-treasurer; Byron Scarborough is assistant secretary; B. L. Coontz is assistant secretary; and W. B. Hague is assistant treasurer. Ben Matheson, New York representative, has been named sales manager. Warren Harry is the new division manager of the Fort Wayne, Inc., plant; and W. D. Rothell is division manager at Los Angeles. R. O. Moore is chief auditor. Thomas has been with Stratoflex since 1953. Previously, he was with Mid-Continent Supply Co.

C. A. Thomas

K. W. Anderson Co. announces

. . . that arrangements have been made for the fabrication and assembly of Uni-Rad heaters in Milan, Italy. Licensee for handling the Italian manufacture is Petroleum Machinery & Service Co. of Milan. The Mott Co., International, division of Mott Co. of Houston, will be in charge of sales. The first project is being readied for delivery to North American Utility & Construction Corp. for a plant in Argentina.

Macco Corp. opens office

. . . at Seward, Alaska. The new facility will supply Alaskan oil well drillers with necessary supplies of drilling mud materials, according to John M. Robinson, vice president and manager of Macco's oil field divisions. Macco drilling mud materials are already available at the warehouses of

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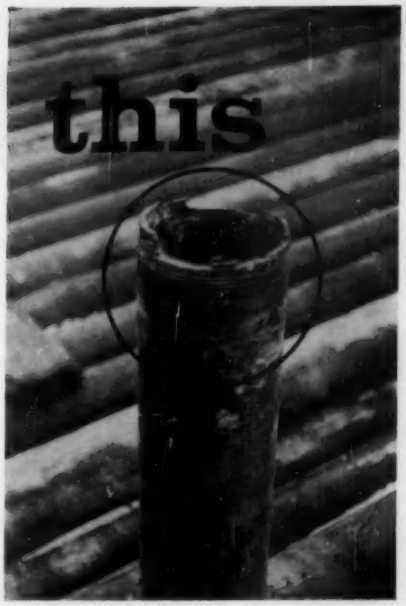

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Seward Fish & Cold Storage Co. in Seward. Tom Reilly, president of this firm, has been named Macco's exclusive distributor for the area.

General Geophysical Co. names

... Kenneth R. Wells as manager of the Rocky Mountain division with headquarters in Denver, Colo. He was a division manager in New Orleans, La. He is a vice president and a director of General and has been with the company for 22 years.

Wire Rope Division named

... exclusive marketing outlet east of the Rockies for all Great Western Cordage products, according to Peter P. Somerville, general manager of J&L Steel Corp.'s Wire Rope Division. J&L will sell, service, and distribute the full line of Great Western Cordage products through its sales force and the 15 J&L wire rope warehouses. J&L sales are expected to be primarily to distributors.

J. B. Allinson appointed

... regional sales representative for Southwestern Engineering Co. in the Mid-Continent and Southwest areas, according to H. W. Wright, Jr., vice president and sales manager. Allinson will represent the engineering and construction division of SWECO and will locate in Dallas, Tex. He has previously been with Merritt-Chapman & Scott, Wyatt C. Hedrick, Braniff Airways, and Ford, Bacon & Davis.

Herbert P. Lee named

... general manager of Aero Service Corp. (Western). He brings a background of 20 years' experience in all phases of photogrammetry to his new position. Aero Service Corp. (Western) is located in Salt Lake City, Utah.

Calvin O. Bell, Jr., appointed

... sales and service representative for Mid-States Chemical Co., Inc., in the Gulf Coast area with headquarters in Houston. He will be in charge of Mid-States Chemical's new warehouse in Houston. He was previously with Mission Valve Co., Houston, for 7 years.

H. L. Watson joins

... McAdams Pipe & Supply Co., as special representative. He will work out of the home office at Bristow, Okla. Prior to joining McAdams, he was with The National Supply Co. and later Fluid Packed Pump Co. in Kansas and Oklahoma.

For a free full color print of the above illustration, suitable for framing, send your request to the Oil Center Tool Company, P. O. Box 3091, Houston, Texas

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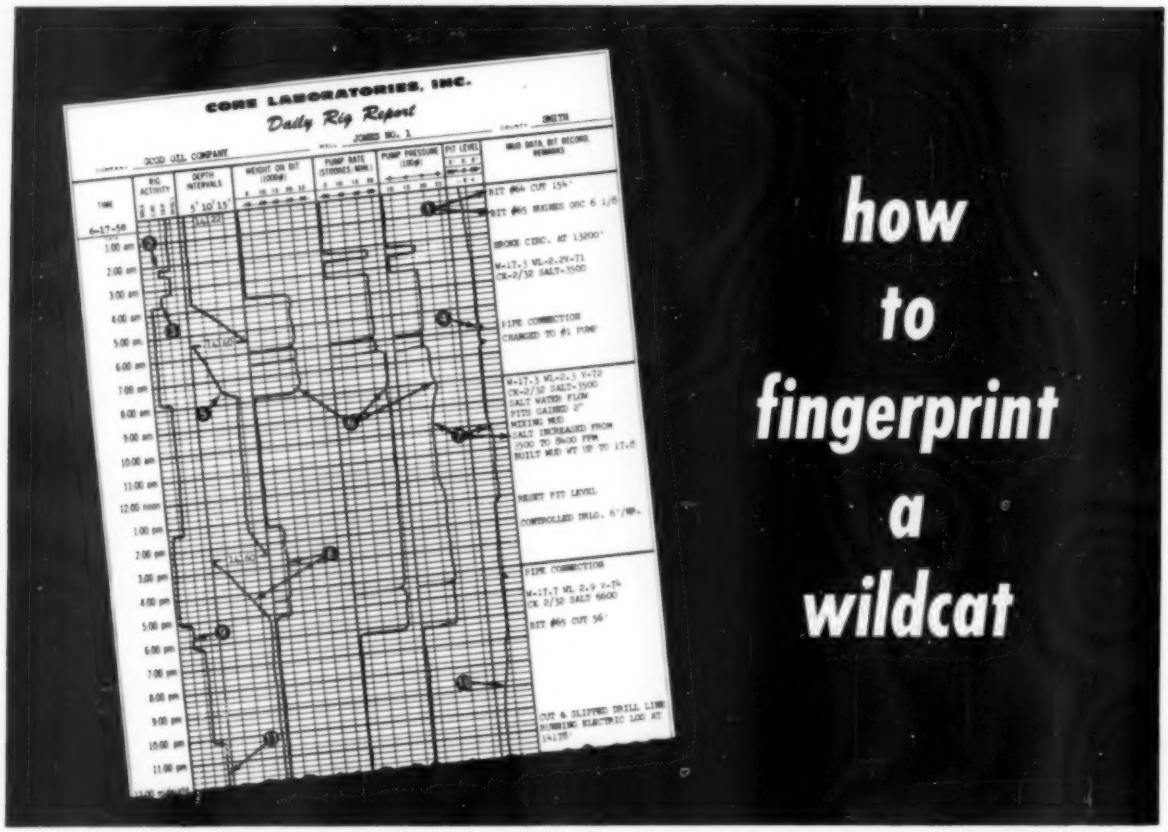

Core Lab's new *Daily Rig Report* is the "hottest" Well Logging Service refinement developed in years.

The source material for this 24-hour, graphical presentation of downhole and surface activity originates at the central instrument panel of Core Lab logging units.

All continuous strip chart recordings and associated information are carefully summarized, accurately plotted, and presented to the operator at the well site. At a glance, he can comprehend 24 hours of rig activity. For example, here's what the Report above reveals about a day in the life of a wildcat —

(1)-Bit record — footage cut by old bit; type and size of new bit. (2)-While making trip back to bottom, crew stopped at 13,200' and broke circulation for 15 minutes. (3)-Circulated and conditioned mud for 30 minutes after getting back on bottom. (4)-Made connection; slight gain in mud suction pit when pumps were off. (5)-7:35 AM; change in slope of depth curve indicated drilling break at 14,149'. (5)-Loss of weight on bit, combined with slight initial reduction in pump rate and initial gain in pump pressure at the time of drilling break, indicated probable high-pressure sand. (7)-Gain in mud level and higher filtrate salinity, combined with delayed loss of pump pressure, indicated definite salt water flow. (8)-Controlled drilling rate of 6 feet per hour, accomplished with only 7,000 pounds weight on bit, indicated drilling was probably still in high-pressure sand. (9)-Circulated and conditioned mud for one hour prior to trip. (10)-Normal loss of mud due to hole fill-up while coming out with drill pipe. (11)-Shut down to change drill line and run electric log, while out of hole at 14,178 feet.

Note: The new Daily Rig Report does not replace Core Lab's traditional Grapholog (hydrocarbon index, lithology, physical characteristics of mud, etc.). To the contrary, it greatly supplements the wealth of information available through Well Logging Service.

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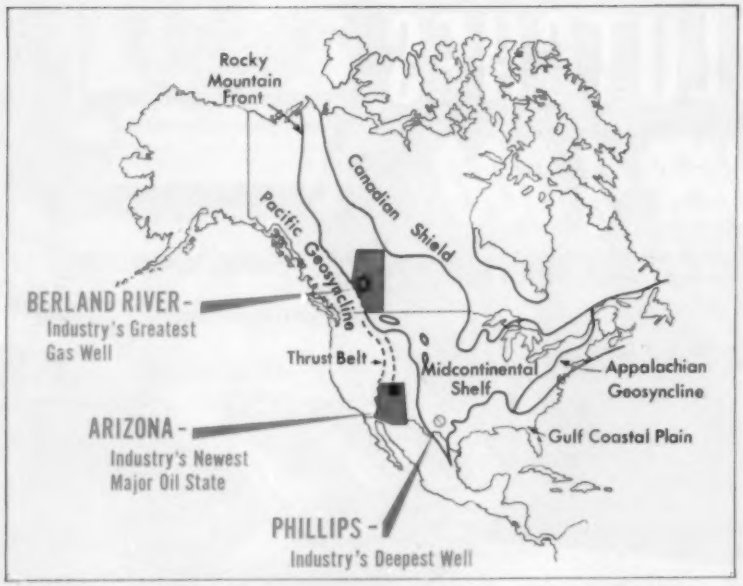

HISTORY is being made at three widely separated points in North America. Alberta produced the world's greatest gas well, Arizona leaped into big oil production, and Texas is about to give the industry its first 25,000-ft. well. These three stories alone will make . . .

1958 a top year in exploration achievement

BY FRANK J. GARDNER

THE YEAR 1958 will probably go into the books as one of oil exploration's greatest. Though drilling is off and a good deal of gloom has pervaded the industry during the year, we have come up with some of the most amazing wildcats in history.

Three of these are pinpointed on the map. They're far apart, and they lie in separate geologic provinces. But each one will be a wildcat to remember.

A great gas well . . . In western Alberta, British American Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., startled us all last week when they finished the biggest gas well on record. This one, the A-8 Berland River, racked up a calculated open-flow potential of 1½ billion cubic feet per day.

In sinking the A-8 Berland River, the operators cut through 663 gross feet of Leduc-Devonian D-3 reef, the thickest such section yet found. Not only that, but it is also the deepest productive D-3 we have known. A deeper reef was cut at Pan American Petroleum Corp.'s 10-10 Berland River, 13 miles southwest of the new hit, but it was water-laden there at 13,000 ft. BA and Shell are completing the A-8 at 12,014-12,235 ft., plugging back to 12,462 from total depth 12,677.

And a good oil well . . . At about the same time, one of the biggest exploration stories of the year exploded in northeastern Arizona, 1,300 miles due south. Here Humble Oil & Refining Co. gave Arizona its first big oil well when it announced a flow of 1,044 bbl. per day on drill-stem test of the Pennsylvanian-Hermosa at its 1 Navajo-E (Section 10-41n-28e) in Apache County. The test was made at 4,600-75 ft.

This isn't Arizona's first oil well, but it's certainly the one that will put the state solidly on the oil map. In 1955 Humble brought in its 1 Navajo in Section 4-41n-28e as the first oiler. That well flowed 4,141 M.c.f. of gas plus 47 bbl. of 39°-gravity oil (½-in. choke) from Mississippian perforations at 5,570-82 ft.; it also produced gas and condensate from the East Boundary-Butte-Paradox field pay at 4,806-16 ft. Not only was it the first oil well in the state, but the Mississippian was a new pay for the field.

Humble says specifically this new discovery isn't a wildcat, but it does lie a mile and a half southeast of previous producers in East Boundary Butte field. It is therefore assumed that the operation is on the same structural uplift as previous wells and that it will go into the records as an extension.

Arizona has long been yearning for this news of "big oil," and when it came the whole state throbbed with excitement. Last February 3 this column advised: "Put Arizona on your calendar for 1958 . . . You may see some christmas trees going up." Now it's obvious that we're going to see a lot more christmas trees in northeastern Arizona in the next few years.

One of the greatest undrilled, unexplored basins lying at the feet of oil hunters today is the vast Black Mesa basin which blankets the Navajo and Hopi Indian reservations in northern Arizona. We predict now that in 5 years' time, Black Mesa will be every bit as productive as the Paradox basin is today.

Plus a depth record . . . The third big exploration story of the year, and probably the one that will linger longest in the history books, lies 600 miles southeast of Arizona's discovery in Pecos County, Texas. Here we are witnessing the world's first 25,000-ft. hole. Phillips Petroleum Co. 1-E.E. University is now digging below 24,509 ft. toward that target depth. Whether it's a dry hole or a producer is a minor item now (though Phillips probably feels differently about it); the important thing is that the industry will have achieved something that was only a dream 10 years ago.

This depth complex that has hit the drilling industry this year is an indication of things to come. We're willing to bet that the 25,000-ft. record will be shattered within the next 2 years and that we'll see a 30,000-ft. well before 1965.

Point to a banner year . . . We don't know what might happen between now and January 1, 1959, but these three stories alone are enough to mark 1958 as a top year of achievement in oil exploration.

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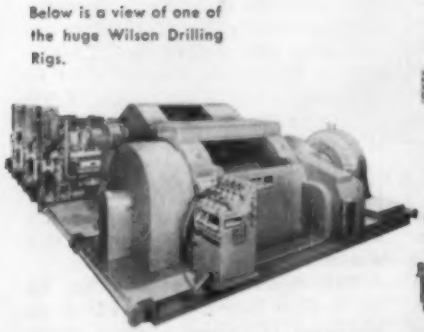
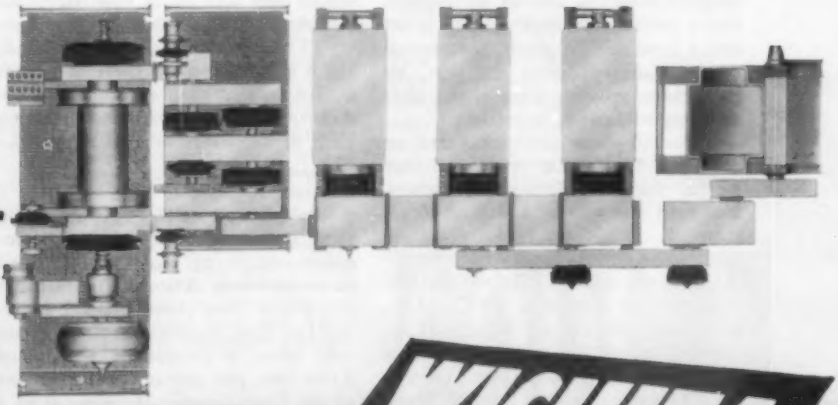
This simple, compact, powerful, trouble-free, Air-Tube Friction Clutch makes possible convenient remote control operations, smoother and faster starting and stopping. It also means longer service at a lower cost because it requires very little maintenance.

You Name it . . . Wherever a Clutch is needed . . . There's a Wichita Clutch to meet the need.

Below is a view of one of the huge Wilson Drilling Rigs.





At right, is a floor plan of a Wilson rig showing the use of fourteen Wichita Clutches.

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Frank W. Yarline Co., Chicago, Illinois
Larry W. McDowell, Long Beach, California
Andrew T. Lobel, Denver, Colorado
Robert R. King Co., Cleveland, Ohio
Allied Transmission Equipment Co., Kansas City 8, Missouri
Norman Williams, Houston, Texas
Donald E. Harman, Dallas, Texas
C. Arthur Weaver, Richmond, Virginia
Malcolm S. Cone, Memphis, Tennessee
Dominion Power Press Equipment, Ltd., Burlington, Ontario, Canada

What's the best way to set up a drilling program?

Proper handling of initial contract can materially increase net profits after taxes.

BY H. O. REYBURN
Lybrand Ross Bros. & Montgomery, Tulsa

THE OIL OPERATORS and investors have as many ways of setting up drilling ventures as a country boy has of coming to town. Two of the most popular routes are the "free-well" deal and the overriding royalty deal. A third route which offers many advantages and is many times overlooked, is the net-profits interest.

The high rate of income tax puts every investor in a position where he is compelled to consider the tax implications of every substantial investment he makes. In the petroleum industry the income-tax provisions are exceptionally complex, and should always be considered in developing the framework of an exploratory drilling deal.

This article calls attention to the disadvantage, to the investor in oil properties, of an arrangement under which he can deduct only a portion of the costs and expenses incurred by him. It shows how his return can be very substantially increased through the use of other types of deals such as the overriding royalty and the net-profit interest.

It should be noted that the illustrations herein are presented in their simplest aspects and that any exaggeration is for the purpose of emphasis.

Before explaining the effect of intangible drilling costs and depletion allowances on exploratory drilling operations, it will be well to summarize two basic income-tax considerations:

Intangible drilling costs . . . The taxpayer may elect to deduct these costs as an operating expense. However, he may be precluded from deducting a portion of them depending on the terms of the deal.

Depletion allowance . . . The taxpayer may deduct depletion from income for federal income-tax purposes on whichever of the two following bases results in the greater allowance:

Percentage—27½% of gross income from the property but limited to 50% of the net income from the property before depletion;

Cost—Based on the cost and expected life of the property, and calculated by dividing the depletable cost by the estimated recoverable barrels and multiplying the result by the number of barrels recovered during the tax year concerned.

For the high-bracket taxpayer ordinary income is often taxed at prohibitive rates. Accordingly, it is important that drilling deals be arranged with two objectives in view:

1. To permit the deduction, as an expense, of all or a greater part of the drilling costs, and

2. To afford maximum latitude for preserving the 27½% depletion allowance.

The need for arranging deals in this manner is clear when it is recognized that:

1. Most investors must be in a position to claim drilling costs as a deduction so as to protect their cash reserves;

TABLE 1—COMPARING TYPES OF DEALS
(Drilling costs are assumed to be incurred in years before production is realized)

Tax Position (all affected years are combined)	Column 1 50% Working interest	Column 2 Overriding royalty	Column 3 Net profit interest — Period before payout	Column 3 Net profit interest — Period after payout	Total
Gross income	$1,000,000	$1,000,000	$600,000	$400,000	$1,000,000
Less: 50% working interest	500,000	.....	.....	.....	.....
Overriding royalty	.....	300,000	.....	.....	.....
Net profit interest	.....	.....	.....	300,000	300,000
Net oil to working interest	500,000	700,000	600,000	100,000	700,000
Deductions (excluding depletion) :					
Drilling cost	100,000	200,000	200,000	.....	200,000
Depreciation of equipment	100,000	200,000	120,000	80,000	200,000
Operating expenses	100,000	200,000	120,000	80,000	200,000
	300,000	600,000	440,000	160,000	600,000
Net taxable income before depletion	200,000	100,000	160,000	(60,000)	100,000
Depletion: (a) 27½%, (b) restricted	(a) 137,500	(b) 150,000	(a) 165,000	.....	(a) 165,000
Net taxable income or (loss)	$62,500	($50,000)	($5,000)	$(60,000)	($65,000)
Tax cost or (saving) at 90%	$56,250	($45,000)	.....	.....	(58,500)
Economic Position—					
Net taxable income before depletion, as above	$200,000	$100,000	.....	.....	$100,000
Amount capitalized as leasehold costs	100,000	.....	.....	.....	.....
Net economic position before federal income taxes	100,000	100,000	.....	.....	100,000
Tax cost or (saving), as above	56,250	(45,000)	.....	.....	(58,500)
Net economic gain after federal income taxes	$43,750	$145,000	.....	.....	$158,500

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2. Whenever drilling costs are capitalized they are generally lost forever as a deduction, because percentage depletion is allowed regardless of whether the taxpayer has any cost. As a result, capitalized costs are beneficial only to the extent that cost depletion exceeds percentage depletion. It should also be noted that percentage depletion availed of serves to reduce the basis of the property for cost-depletion computation purposes.

Drilling for an Interest

Assume that the drilling of a well costs $200,000. Under the agreement between the promoter and the investor, the investor drills the well at his sole cost and expense down to the casing point and receives a one-half share of the working interest. Since the investor has only one-half of the working interest, he may charge off only one-half of the intangible drilling cost —$100,000. The other half will be capitalized as leasehold costs.

Next, assume that the well produces $1,000,000 of oil for the working interest, and that the investor is able to claim full percentage depletion. His half-interest in the oil will provide him with a depletion allowance of $137,500—or 27½% of his half of $1,000,000. This exceeds his $100,000 capitalized portion of the drilling cost —so that portion of the cost will be lost to him completely. A taxpayer in the 90% bracket would have to earn $900,000 of ordinary income to offset such a loss after income tax. A corporation in the 52% tax bracket would have to earn $208,333. The details for an individual are shown in Column 1 of the annexed table.

In the foregoing example it was assumed that the percentage depletion allowance was earned. Had this allowance been restricted (limited to 50% of net income), there would still be an economic advantage if 100% of the drilling cost is charged as an expense as long as any percentage depletion is allowed over the life of the property. In addition, there is the advantage of a much smaller cash outlay—after taxes—if all the drilling costs can be charged off in the year that the well is drilled.

Drilling With an Override

It is possible to arrange a deal enabling the investor to have the advantage of deducting all the drilling costs, yet still permitting the promoter to keep substantially the same interest from an economic standpoint.

Two types of deal are commonly used to produce this result:

1. Retention of an overriding royalty, and
2. Retention of a net profit interest.

In each case the investor has to spend more money initially; however, he derives certain advantages which may very well justify the additional capital outlay.

This may be illustrated by assuming the same facts as in the first example. However, the promoter retains an overriding royalty sufficient to produce the same economic income as a 50% working interest before calculating taxes. Column 2 of the table shows that the investor's return under this arrangement has been raised to $145,000 from $43,750.

The greater economic gain to the investor in this example is caused mainly by the allowance as a tax deduction of 100%, rather than 50%, of the costs and expenses. The promoter would get $55,000 less in depletion allowance over the life of the property, but it is assumed that his tax bracket would not be so much of a factor as that of the investor ($500,000 working interest—$300,000 override = $200,000 × 0.27½ = $55,000). Moreover, the promoter gains the added advantage of a completely free ride at no risk.

Drilling With a Net Profit Interest

The investor will probably try to avoid an override of the magnitude shown in the preceding example because the property may not be as good as expected. The promoter, on the other hand, will seek to avoid a low override as the property may be better than expected. Sliding-scale overrides create many complications, but they do sometimes help to solve this problem.

The other alternative—the net-profit interest the holder of which shares only in net profits—eliminates some of the difficulties involved in an override deal. Even more, it can provide a better deal for the investor with economic results to the promoter equally as good as in the previous example if his proportionate part of the investment pays out—and much better if it fails to pay out. "Payout" means recovery of investment through production.

Column 3 of the table shows how the net-profit interest method works and affords a comparison with the override method.

A Word of Caution

Of course, the examples here illustrated oversimplify the problem because definite facts are assumed, and there are never definite facts in the exploratory and production phases of the petroleum industry. In addition, failure of the parties to agree on compensating factors might make such a deal difficult—and sometimes impossible. Finally, it must be recognized that most exploratory ventures result in dry holes; and, while tax advantages are obtainable when production is realized, there will always be an economic loss to all who share in the risks of an oil and gas venture that results in a dry hole.

There may be—and often will be —factors which cause an otherwise favorable method of approach to become relatively disadvantageous, such as the carry-forward of an operating loss or the existence of operating losses in the same tax year. All relevant factors require consideration in developing the type of deal that is likely to afford the best tax and economic advantages to all who are concerned. With the high rate of taxes and the unusual features of taxation in extractive industries, the promoter and investor in any exploratory oil and gas venture should thoroughly explore the tax aspects before finalizing the structure of their financial arrangements.

Trenton hunt rolls in Michigan

THE HUNT for more productive Trenton structures in southern Michigan is gaining momentum.

Deals now taking form largely are the result of lease blocks taken a year ago immediately after the Scipio (5s-3w) Hillsdale County boom started.

W. R. Grigg and N. E. Marshall of Mt. Vernon, Ill., spudded a 3,100-ft. Trenton test on 1 Thunder, NW NE NE 27-6s-11w, St. Joseph County. Location is 50 miles west of Scipio field, and only 15 miles north of the Indiana state line. Only eight other test wells have been drilled in St. Joseph County, and only two of the eight drilled below the 1,200-ft. Traverse beds.

McClure Oil Co. spudded 1 Abbott, NE NE SE 29-2s-3w, Jackson County, 15 miles north of Scipio field. Two other wildcats 12 to 15 miles southeast of Scipio field are drilling. These are E. E. Brehm 1 Tucker, NW NW NW 18-6s-1w, and Bryan Edwards 1 Rose, NW NW SE 6-7s-2w.

The relatively new Reed City zone play in Montcalm County sustained a setback as Otterbine and Merrill's 1 Ehgotz, SE SW SW 28-12n-9w, 1,320 ft. east of the discovery, drilled the zone dry. It was the first completion in the play since Merrill and Otterbine drilled a 125-bbl. discovery, located a mile south of the old Amble pool.

A NEW five-pay field was opened in south-central Oklahoma's McClain County. The discovery well is Kirby Petroleum Co. 1 Weeden, Jr., an Ordovician and Pennsylvanian strike. Fig. 1.

J. M. HUBER Corp. 1 Sodowsky, Northeast Cheyenne Valley field, Major County, flowed 1,630 bbl. of oil per day to add zest to the feverish northwestern Oklahoma drilling campaign which is at its highest peak in history. Fig. 2.

Sooner success continues to stack up

NEW SUCCESS is reported in the Lovedale area of Harper County, Northwest Oklahoma. Calvert Drilling Co. 1 Selman found gas and distillate in the Morrow and Tonkawa Pennsylvanian sands. Fig. 3.

TONKAWA gas production was tapped at Cameron Oil Co. 1 Conner in the Camp Creek area of Beaver County, Oklahoma Panhandle. Location is south of the huge Mocane area. Fig. 4.

OKLAHOMA'S successful wildcatting campaign is rolling on to new laurels each week. Wildcat discoveries are reported in nearly every sector of the state, particularly in the south-central and the northwestern counties. Highlights of early autumn drilling are recent discovery areas in McClain County in the south-central, and Major, Harper, and Beaver in the northwest.

McClain County . . . Multiple-pay production is being tapped at an important wildcat in the East Washington area.

Kirby Petroleum Co. 1 Weeden, Jr., found production in four Ordovician sands and a fifth pay in the Pennsylvanian-Deese sands. Nearly 300 ft. of pay is reported from the top of the Bromide through the Oil Creek sands. Drill-stem test at 9,658-9,815 and 10,006-50 ft. flowed 186 bbl. of oil in 12 hours from the lower zone on ½-in. choke; the McLish made 242 bbl. in 12 hours on 24/64-in. choke; the Tulip Creek test at 9,496-9,573 ft. got 159 bbl. in 12 hours on ½-in. choke. The south offset to this new field opener is now drilling after finding oil in the Deese sand.

The Washington area of Oklahoma has long been prolific in Ordovician oil. Several big fields have been put on the records in the past few years along the regional fault trend which runs northeast-southwest through part of the county.

Major County . . . Prolific oil production was reported at J. M. Huber Corp. 1 Sodowsky in new Northeast Cheyenne Valley field in northeastern Oklahoma.

This field well flowed 1,630 bbl. of oil daily from perforations at 6,890-6,941 ft.

. . . Seiling area. A reworked well in SE SW NE 33-29n-16w, Major County, flowed 5,125 M.c.f.d. of gas plus 20 bbl. distillate per million from the Layton sand at 7,006-40 ft. This Pennsylvanian strike is part of a revival in the Seiling area, just northeast of the town of the same name.

Harper County . . . The seemingly endless parade of discoveries in Harper County, northwestern Oklahoma, continues unabated.

Calvert Drilling Co. 1 Selman, near Lovedale in SE SE NW 8-26n-20w, flowed 6,100 M.c.f.d. of gas with distillate on drill-stem tests of the Tonkawa Pennsylvanian sand at 5,020-70 ft. Gas also flowed from the Morrow-Pennsylvanian at 6,000-99 ft.

Beaver County . . . The fast-filling patchwork of oil, gas, and distillate fields in this Oklahoma Panhandle county added another spot. Cameron Oil Co. has a discovery at 1 Conner in SW NE 5-2n-25eCM, near Camp Creek field. The well flowed 10,500 M.c.f.d. of gas from Tonkawa sand perforations at 5,636-70 ft.

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Swan Hills pay moves to far north

RED EARTH CREEK appears headed for a major oil find—production in the "Slave Point" or Beaverhill Lake Devonian formation, famed producer at Swan Hills and Kaybob.

MENTION Red Earth Creek and immediately the Granite Wash formation comes to mind as it is in that area of Alberta that the province's only major accumulation of oil in that structure is found.

The region, lying some 210 miles north-northwest of Edmonton, became an interesting oil patch on February 4, 1956, when Union Oil Co. of California completed its discovery well, 12-17 Red Earth, with an initial potential of 792 bbl. of 38°-gravity oil from the Granite Wash horizon. Since that time the company has stepped out as far as 9 miles with varied success in the same structure, but this week the "bombshell" was dropped when another oil zone was tapped, which, as it now stands, appears commercial as well.

New pay . . . The second zone to be discovered in an area that almost defies the movement of heavy equipment in the summer months, due to a very muskeg condition of terrain, was the Slave Point or Beaverhill Lake sector of the Middle Devonian. That horizon is about 700 ft. shallower than the famed Granite Wash in the area and although indications of the structure have cropped up before, this is the first occurrence of free oil. The closest previous find in the Slave Point lies some 120 miles due south at Home Oil Co., Ltd.'s, development in the Swan Hills area. Although the new find cannot be rated with the better of those wells at Swan Hills, it is nevertheless one of the most interesting oil discoveries to come along for some time and makes the Red Earth Creek area even more attractive.

Unlike the Granite Wash strike, the new find is not expected to touch off any large land rush as most of the lands in the vicinity are now held under reservation form with a large block in the immediate vicinity of the well controlled by Union itself. It will be remembered that when the original discovery was made at Red Earth, the land rush, even 2½ years later, staggers the imagination. It has been estimated that more than 35,000,000 acres across northern Alberta and Saskatchewan were gobbled up in Western Canada's largest land rush.

The new discovery hole, 4-20-88-8 Union Red Earth, was drilled on LSD 4, 20-88-8w5. It is 1 mile due south of the Union 4-29 Red Earth wildcat abandonment, 1½ miles north-northwest of the Union 14-8 Red Earth dry hole and 6½ miles almost due north of the 12-17 Red Earth Granite Wash strike.

Set up as a test of the first pay section encountered in the region, the venture was carried to that deeper structure, but after finding it water-laden it was decided to plug back and attempt evaluations in the Beaverhill Lake-Slave Point sector. It was then that discovery was made as 1,410 ft. of clean, light-gravity oil entered the drill stem, along with 310 ft. of heavily oil-cut mud. Since that time, production casing has been run in the hole and perforations opposite the pay sector made so that further production tests could be made in an effort to access the well's commerciality. Those tests are now being carried out with first report indicating a rate of 12 bbl. per hour of clean crude.

The strike was made on Petroleum and Natural Gas Reservation No. 2349 which also contains the largest amount of the development and step-out drilling that Union has carried out in the region for its Granite Wash play. Actually there have been 15 wells drilled by the firm not counting the initial strike and 9 of those were successful in the Granite Wash, although some of them have not as yet been production tested.

Therefore, the sixteenth paid off with the new zone and raised the number of indicated successes to 10. The only other well drilled previous to the Union strike was Imperial's 8-11 Red Earth and it was unsuccessful.

Illinois scores with three new fields

THREE new pools, Carlinville South in Macoupin County, Bowyer in Richland County, and Coil North in Wayne County, were discovered in Illinois in August. Only one producing well has thus far been completed in each of the pools.

There was also an extension to Clay City Consolidated pool in Richland County.

A total of 217 wells were completed in August, a 5-week period, for an average of 43 per week. The 217 completions include 87 oil wells and two gas wells, or 41% successful.

Crawford and Hamilton counties, each with 19 wells completed, had the most completions during August. Christian and White counties followed with 18 completions each. Main Consolidated pool in Crawford County, Dale Consolidated in Hamilton County, and Mt. Auburn Consolidated in Christian County, contributed most heavily to the number of completions in their respective counties. In White County the completions were fairly well scattered. One of the wells in Dale Consolidated, Hamilton County, was completed for 950 bbl. of oil per day, and one in Mt. Auburn Consolidated, Christian County, for 416 bbl. per day.

Another area worthy of note is the Omaha pool in Gallatin County where several wells were completed in August for more than 200 bbl. per day and one for 528 bbl. Estimated production for August is 6,926,000 bbl.

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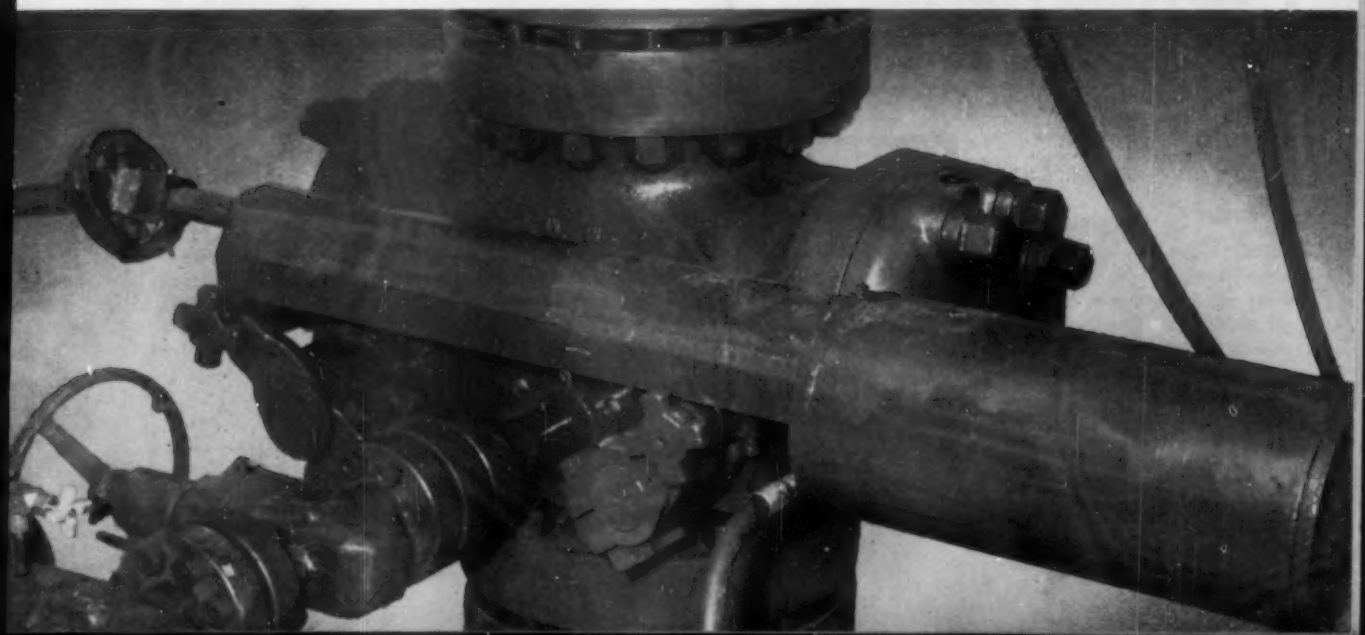

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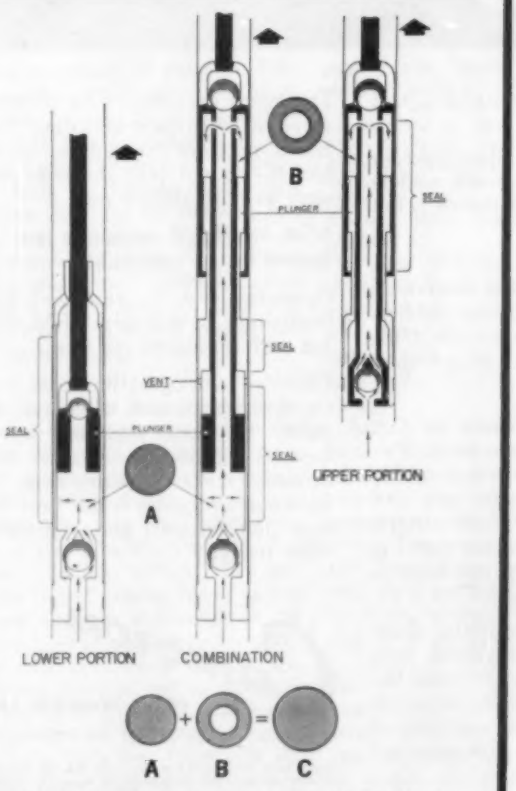

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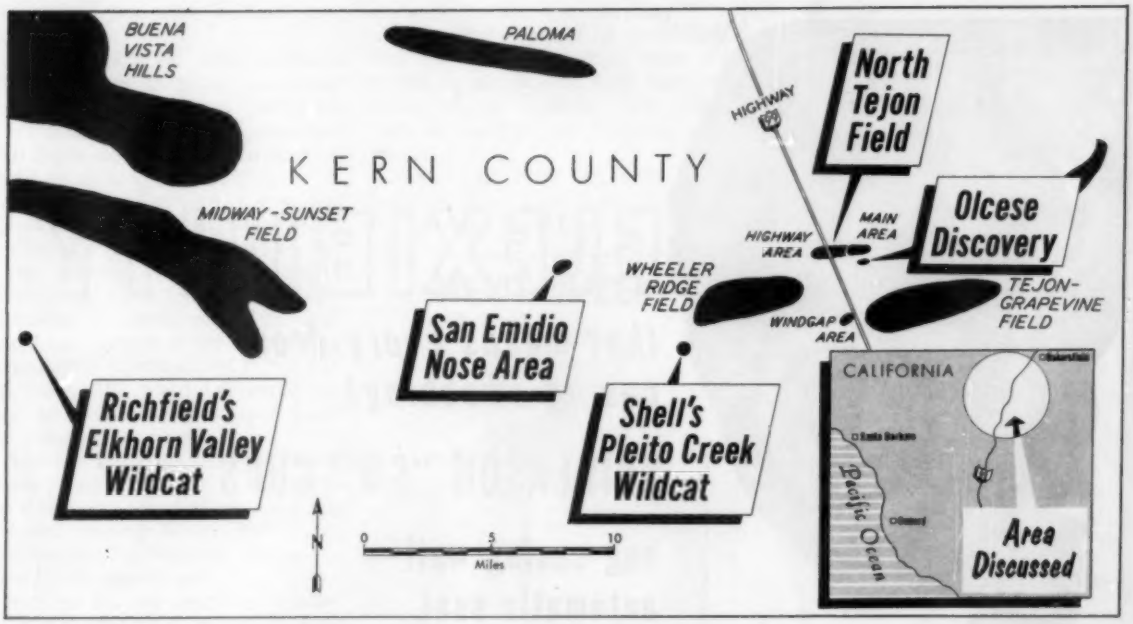

On the southern rim of Kern County's San Joaquin Valley . . .

California drillers take a second look

A SERIES of wildcat successes has again focused the exploration spotlight on the southern rim of California's San Joaquin Valley.

Discoveries at North Tejon, Wheeler Ridge and San Emidio have touched off extensive studies as operators prepare to take a new and deeper look at a region which dates its first drilling project back to 1901.

The history of this part of the state is filled with drilling spurts. The last one occurred in 1952 when Richfield Oil Corp. tapped Eocene production at Wheeler Ridge. The resultant search for additional Eocene pools was largely unsuccessful but did result in a number of Miocene discoveries at Wheeler Ridge, Tejon, and the Los Lobos field.

In general, this latest search is aimed at local highs, faults or other structures along the southern flank of the basin.

Typical of play . . . Typical of this current activity is Reserve Oil and Gas Co.'s experience leading to the discovery of North Tejon field, one of the most important discoveries in California of the past 6 years.

Reserve geologists and others suspected a high existed about 2 miles north of the main Tejon-Grapevine area. These suspicions were based on regional geology only, plus what meager information was available from two tight-hole wildcats drilled in the area some years previous.

After four wildcats and little success, Reserve in 1956 decided to start over again and completely shoot the area. Seismic studies confirmed the high and indicated it was a nose, or anticline.

Since the seismic studies, Reserve has yet to drill a dry hole along the high. The score now reads seven excellent wells in four different pools. Three are in the Vedder and one the Olcese.

Shortly after Reserve's discovery at North Tejon, Richfield entered the play and scored a big Vedder discovery about 1 mile due west of Reserve's discovery area in what has since been designated the Main Area. Richfield found Vedder some 2,000 ft. higher than Reserve. The Richfield discovery has been labeled the Highway Area.

Development in the Main Area has been east, west, and south. Immediately south of the Main Area, Reserve made a still deeper pool discovery in the Vedder formation, and ½ mile south of it found a prolific Olcese pool at a shallower depth.

The Vedder zones are located just below a 1,200 to 1,600-ft. thick basalt section in the Main Area while the Olcese pool is just above the volcanics. Richfield has encountered only a small volcanic section at its Vedder production in the Highway Area.

Although still to be proven by the bit, estimates are the North Tejon field could extend several miles long and as much as a mile wide. The Olcese discovery to the south opens up prospects for Olcese, JV and Vedder production in a strip about 7 miles long by as much as 4 miles wide, according to geologists familiar with the region.

Drilling in the Main Area is pretty costly due to the thick volcanic section that has to be penetrated enroute to the Vedder. Some 21 to 30 days are required to drill through this basalt section. About 90 days are needed to drill the 12,000-ft. wells with costs running to $300,000 each.

Currently Reserve is working on both west and east extensions in the Highway Area as well as an east extension to the JV pool in the Windgap area of Wheeler Ridge 2 miles south of North Tejon.

Richfield has two stepouts under way in the North Tejon Highway area. One is ½ mile due west of the pool discovery, while the other is about ¼ mile southwest. The southwest extension is slated to take a look at the deeper Eocene sand. Richfield is also active in the JV Wildgap play with a site staked for a wildcat ½ mile southeast of the nearest Windgap producer.

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basin, these interesting wildcats were shaping up:

Approximately 2½ miles northwest of North Tejon, Richfield was getting ready to spud in a wildcat. While the operator hasn't revealed the programed total depth, outside sources indicate it might go as deep as 20,000 ft.

Richfield was moving a company rig on a site 1 mile southwest of its San Emidio Nose discovery. This will be the operators' second extension to its discovery made last July. The first extension, a northwest effort, was completed recently in the Reef Ridge formation at 11,491-11,548 ft. for 363 bbl. daily. This was substantially less than the discovery which made 1,200 bbl. daily until choked back.

About 5 miles northeast of North Tejon, Standard Oil Co. of California has a large area blocked out along the east-west-trending White Wolf fault. First test for this fault line play is expected to be started soon.

Shell Oil Co. just completed a wildcat ¾ of a mile south of Pleito Ranch field and the same distance east of Pleito Creek field. This area is several miles west of Wheeler Ridge. The new discovery was brought in flowing 316 bbl. daily from a Miocene interval at 8,980-9,793 ft.

Richfield announced plans to go back into Elkhorn Valley, 7 miles south of Taft and 4 miles from nearest production in the old Midway-Dunset field, for a new try. This valley has been looked at by operators since 1926, without success thus far. Richfield itself has drilled four dry holes there in the past. The deepest, located 5 miles southeast of this latest effort, went to 7,037 ft.

The recent experience of operators in the southern San Joaquin Valley is similar in many respects to successful searches conducted elsewhere in California. It involves continually going back into largely already known areas of promise and restudying the evidence for deeper drilling prospects.

The bulk of new reserves turned up in the state since the Korean War has been from these new pool discoveries on the edge—or right in the middle—of already producing areas.

Kansas exploration picks up tempo

NORTHWESTERN KANSAS' Pennsylvanian play is gaining momentum. Phillips Petroleum Co. completed its 2 Llanos in C SW NE 10-6s-37w, Sherman County, on pump for 120 bbl. of oil and 2 bbl. water daily from Lansing-Kansas City perforations at 4,474-90 and 4,456-62 ft.

This well is the southwest extension discovery to the field discovery. It is also the third producer in Llanos field and the first to produce from the famed Lansing-Kansas City lime, the state's biggest producer. The other wells in the field are Cherokee producers.

Tests in the other two wells in the field did have good recoveries from the Lansing-Kansas City, however.

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Here's oil-finding activity

. . . in Kentucky

FIRST deep (basement) wildcat test for Breathitt County is making good progress as United Fuel Gas Co. drills ahead at 5,425 ft. at 1 S. B. Williams.

Location is on Quicksand Creek about 4 miles east of Jackson, the county seat. Formation tops released to date include: Mississippian Big Lime 1,033 ft., Berea 1,562 ft., Corniferous 1,921 ft., and Knox dolomite 4,560 ft.

Elevation of test is 750 ft. A hole full of water was reported at 4,845-48 ft.

. . . in Alaska

RECOGNIZING the growing importance of Alaska as an oil exploration province, there will be two papers covering this area at the 28th annual international meeting of the Society of Exploration Geophysicists in San Antonio, October 13-16.

"Magnetics in an Exploration Program with Particular Reference to Alaska" will be discussed by Dr. Richard A. Geyer of Geophysical Service, Inc. Taking specific examples in Alaska where U. S. Geological Survey aeromagnetic data are available, the use of magnetics as a means of resolving the question of geologic cause of certain types of gravity anomalies and other specialized geologic problems will be presented.

An important paper on an area of particular petroleum prospecting interest will be "An Aeromagnetic Study of the Cook Inlet Area, Alaska" by I. Zeitz, G. E. Andreason and A. Grantz.

. . . in Oklahoma

PHILLIPS Petroleum Co. has discovered deep gas production in the Marmaton formation near the center of its 285,000-acre Hugoton gas block in Texas County, Oklahoma Panhandle. The discovery well, 2 Pearl, had a calculated open-flow potential of 23.2 M.M.c.f. of gas and 139 bbl. of distillate daily from perforations between 5,740-48 and 5,760-72 ft.

The nearest production at similar depths is 11 miles southeast near the border of the company's block. Phillips is drilling below 5,600 ft. in another deep test approximately midway between the discovery and this production. Phillips' entire Hugoton block produces gas from shallow wells at depths to 3,000 ft.

The 2 Pearl is in Section 16-1n-15e, 7½ miles south of Guymon and 8½ miles northwest of Hitchland. Phillips has spudded in a confirmation well ⅝ mile southwest of the discovery.

. . . in Pennsylvania

GAS DISCOVERIES continue to highlight drilling in the Appalachian province. This has been one of the most significant wildcat years in some time in Pennsylvania. The newest addition is Peoples Natural Gas Co. 1 J. Blair in the Seven Springs area of Westmoreland County on the Laurel Hill anticline.

This well produced 3,500 M.c.f. of gas on initial tests after fracturing.

To basement . . . Pennsylvania's first basement test (in the western part of the state) has just been completed. Benedum - Trees' Kardosh well in Crawford County was plugged and abandoned at a total depth of 8,030 ft. in granite wash. No other information is available on this important wildcat.

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Squarely between two fields . . .

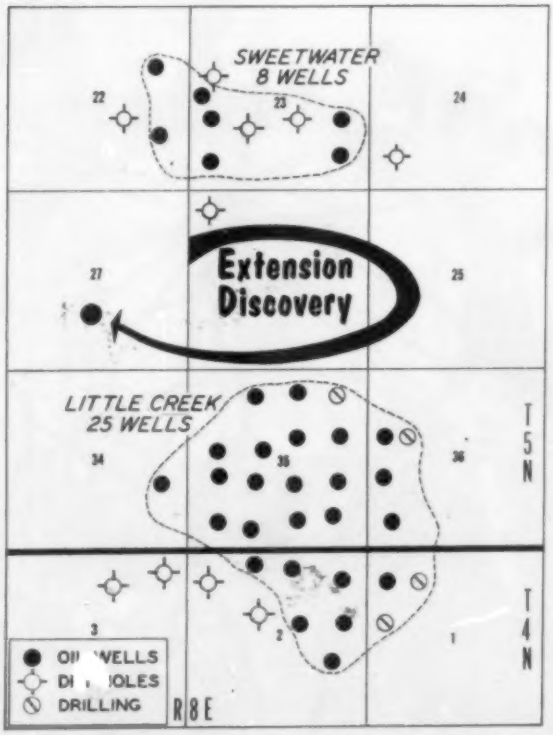
Mississippi extension puzzles oil hunters

A NEW OIL WELL a mile northwest of the active Little Creek field and the same distance southwest of its sister Sweetwater field, in Lincoln County, Mississippi, is arousing some speculation on which field it extends—or if it extends both.

The well, a joint operation of Vasser & Howard and Paul A. Radzewisz, is completed in the Upper Cretaceous-lower Tuscaloosa sand with pay perforated at two intervals, 10,810-21 ft. and 10,824-43 ft. It flowed, at completion, at the rate of 338 bbl. of 39°-gravity oil (plus 13 per cent b.s. and w.) per day through 9/32-in. choke. Flow was with pressure of 380 psi. and gas-oil ratio of 380 cu. ft. per bbl.

Pay is the same as that in both Little Creek and Sweetwater fields and at a comparable depth. The new well topped the lower Tuscaloosa sand at subsea depth of 10,248 ft. (actual depth 10,698 ft. with surface elevation of 450 ft.). Subsea tops at both Little Creek and Sweetwater have run from 10,210 to 10,250 ft.

Little Creek, opened last January, has proved one of Mississippi's most important discoveries in recent years, from the standpoint of development and productivity (OGJ, July 21, p. 138). An active drilling program has pletion, the field's most westerly well. to date with productive area extending from Lincoln County southward into northern Pike County. Wells have had initial flows ranging from 155 to 871 bbl. per day through small chokes. Most flow rates have been above 500 bbl. per day. Thickness of the pay has run from a minimum of 20 ft. to as much as 72 ft. The latter thickness was in the most recent com-



MISSISSIPPI'S Little Creek and Sweetwater field in southern Lincoln and northern Pike counties with their possible common new extension producer.

resulted in completion of 25 oil wells

So far the only dry-hole definition of the productive area has been on the extreme southwest side, where the sand had shaled out, and in a test more than a mile southeast.

Northernmost production so far at Little Creek is less than 1½ miles south of nearest production in the older but less spectacular Sweetwater field, but a deep dry hole at the south edge of that field has appeared to have defined it there and separated it from its newer sister field to the south. Since development at Sweetwater has been spotted and marked by dry holes within its apparent productive area, there is a possibility of another link between the two fields.

Sweetwater, discovered in January 1954, now has 8 oil wells. In addition to the dry hole on the south edge, there is one on the far west, another on the far east, a third on the north edge, and two at questionable location between producing wells.

Interest brightens on East Texas' salt domes

INTEREST in East Texas' salt domes has run high this year, with a fairly high level of work being maintained. New exploration on or near the domes was announced last week for Mt. Sylvan salt dome in western Smith County, and Butler dome in southeastern Freestone County.

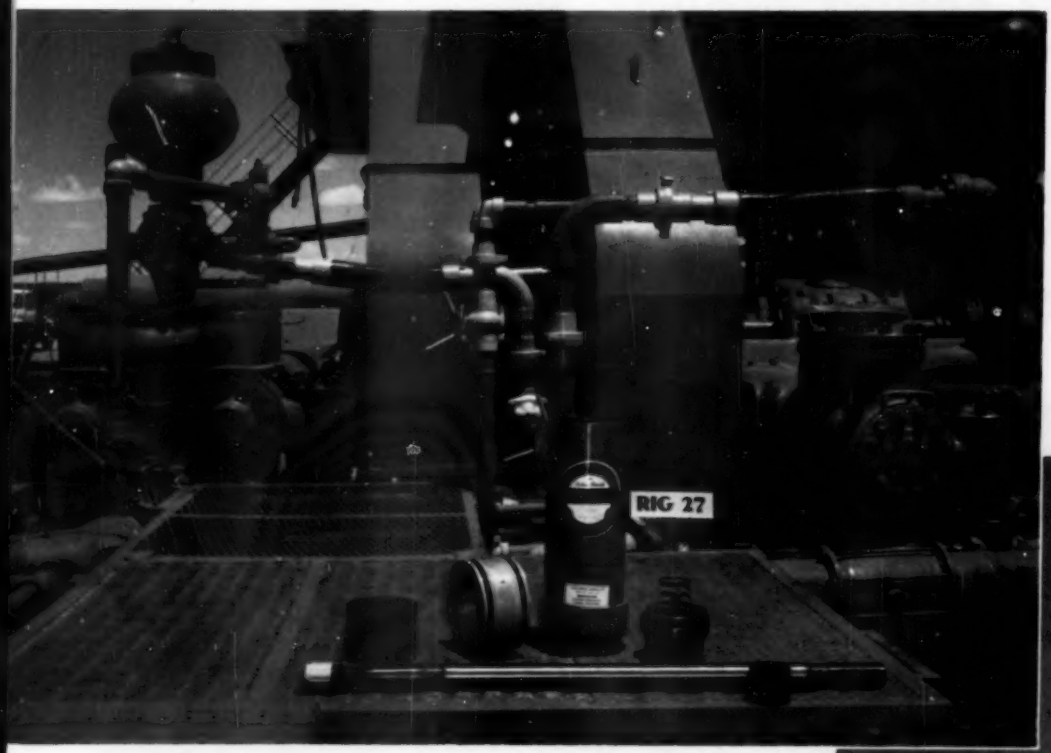
Drilling was under way at the Butler dome test at this writing. It is The Texas Co. 1 Daniel Memorial Orphanage, scheduled to 12,000 ft., with the Travis Peak as its main objective.

Location is 2 miles east of Butler townsite on an 821-acre lease in the Simon Sanchez Survey, A-30. The well was said to be located on or near the edge of Butler dome, near four Woodbine tests drilled earlier this year by W. C. Perryman and George Greer. No. 2 Daniel Memorial Orphanage was about two locations southwest of Texaco's new project. It went into salt at 4,515 ft. and stopped drilling at 4,640 ft., still in the salt and above the Woodbine. The other three tests reported indicate shows in the Woodbine.

The Mt. Sylvan salt dome test is Gulf Oil Corp. 1 D. M. Jackson, located on a 320-acre tract 8 miles west of Tyler in Smith County, in Philip Lively Survey, A-578. Projected depth is 6,800 ft., which is expected to test the Woodbine.

Nearby tests which will furnish control include J. K. Wadley 1 Adams, 1¼ miles to the southwest, in Van Zandt County. This well went to 5,900 ft. with no shows. To the east, 1½ miles, B. G. Byars drilled 1 Beaird to 5,698 ft., and immediately north of this failure D. D. Feldman 1-A G. P. Verner was drilled dry to 5,348 ft.

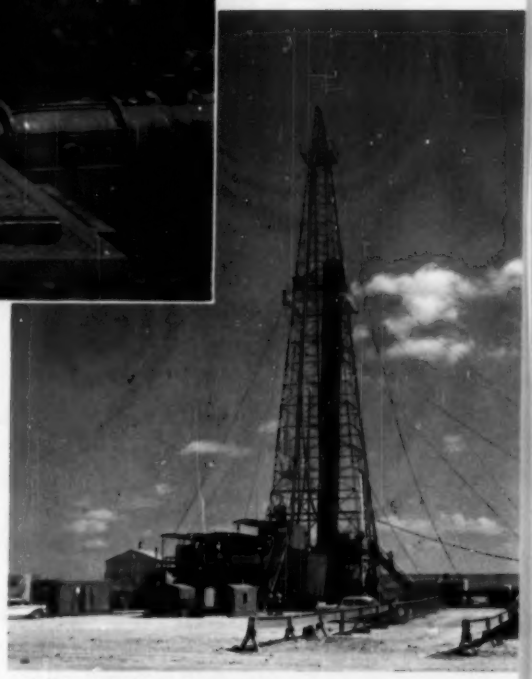
How MISSION pump parts helped "drill" the world's deepest well before it was even spudded!



Long before the Phillips Petroleum Company's 1-EE University started drilling, Mission research engineers had already designed and tested, in Mission's own mud pump laboratory, the vital pump parts that helped carry this well to its new world's record.

Under simulated extreme conditions that could be anticipated in drilling to 25,000 feet, the Mission Rods, Liners, Valves, Pistons, Liner and Gland Packings that figured in this remarkable drilling achievement passed all tests like the champions they are.

The drilling of the Phillips Petroleum Company's 1-EE University is not only a tribute to the pioneering spirit of the Phillips Petroleum Company, it emphasizes again the foresight and ingenuity of the oil tool manufacturers and technical services fraternity who are partners in petroleum progress.



Phillips Petroleum Company's 1-EE University in Pecos County, Texas.

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THREE ROILINE ENGINES

drilling

World's Deepest Well

...23,450 ft. and still going

ROILINE ENGINES

Phillips Petroleum Co. Rig No. 27, in Pecos County, Texas, has three ROILINE Engines

In Pecos County, Texas, Phillips Petroleum Co. Rig No. 27 is drilling the world's deepest oil well—with three L-4000 ROILINE Gas Engines.

Designed for deep hole drilling, these modern, compact gas engines have the additional power, with fast response to load demand, that makes more hole. They do it with less fuel; and maintenance is easier, too.

With their 12 cylinders in V-type arrangement, Model L-4000 ROILINES are basic valve-in-head engines of 4000 cu. in. displacement, 7.54 bore x 7.5 inch stroke, operating on gas fuel. Hydraulic "Zero Lash" valve lifters eliminate tappet noise and adjustments and extend valve life. Exhaust manifold is water cooled and integrally cast into crankcase to provide cooler operating area and fast warm-up of the engine. Removable wet cylinder sleeves; counterweighted crankshaft and precision bearings; full flow oil filters and many other ROILINE features are all fully described in Bulletin E-7.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

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Four hits boost Texas exploration

FOUR Wilcox sand discoveries within a week are giving impetus to the spread of Eocene exploration through southern DeWitt County, in the Central Texas Gulf Coast area.

Another DeWitt County discovery was indicated at the close of the week in a wildcat in which testing of a deep high-pressure sand was being attempted.

Yorktown, Ltd., is extending and reviving the old Yorktown Wilcox gas area with a new-pay discovery. Its well, 1 Yorktown-T. F. Boldt, is productive of gas and condensate from a zone interval at 7,109-19 ft. It is 2,000 ft. southwest of the nearest of two gas wells which comprise Yorktown field, discovered in April 1942.

South of Meyersville, in the south corner of the county, Claud B. Hamill is completing a gas-condensate discovery well in the first Massive Wilcox sand, perforated at 8,138-48 ft. This well, 1 Haun (B on map), is in the gap between Doehrmann field, on the north, and Meyersville field, on the south, but is separated from them by dry holes. It is only 1½ miles from the intersection of the DeWitt, Goliad, and Victoria county lines. Doehrmann field dates from July 1954, and Meyersville from January 1947.

At C, Holland-American Petroleum Corp. is opening a new Wilcox zone in Anna Barre field, 3¾ miles southwest of Thomaston. Its 2 Anna Barre is rated good for 46,500 M.c.f.d. of gas, open flow, recovering 15 bbl. of 58°-gravity condensate per 1 M.M.c.f. The new pay, perforated at 9,102-14 ft., is the fourth and deepest for the area. The first was discovered in June 1954.

FOUR new Wilcox discoveries in one week enliven exploration in southern DeWitt County, Texas. Indicated by arrows, left to right, they are: A—new gas-condensate pay and extension at Yorktown; B—new gas-condensate field in gap between Doehrmann and Meyersville fields; C—fourth and deepest pay in Anne Barre field; D—new oil area southeast of Thomaston.

The fourth discovery of the week was by Harkins & Co. and George A. Musselman at their 1 Atkinson (D on map), a wildcat 1¼ miles east of Thomaston and southwest of Jennie Bell field. It is about 5 miles east of Holland-American discovery at Anna Barre field.

The well, perforated at 7,990-92 ft., tested 72 bbl. of oil per day, flowing through 7/64-in. choke under pressure of 570 psi. with gas-oil ratio of 836 cu. ft. per bbl. Jennie Bell field, discovered in July 1952, is productive of oil and gas from several sands from 7,950 to below 8,400 ft.

In addition to these four discoveries, Kirkwood & Morgan, Inc., is attempting to test a 10,100-ft. Wilcox sand in a wildcat 6 miles southeast of Cuero. The wildcat, 1 Koenig, is one in which high pressures were encountered. Hole was drilled to 10,659 ft., where, because of the pressures and hazard of blowout, drillpipe was cemented in the hole. Pipe has been perforated at 10,096-106 ft. Location is about 4 miles north of Arneckville field.

Utah test shows significant flows

GREAT LAKES Natural Gas Corp. announced recently that its well Unit 1, Stone Cabin area, formerly known as the Jacks Canyon area, in Section 13-12s-14e, Carbon County Utah, has been tested, and produced on absolute open flow at the rate of 5 M.M.c.f.d., plus some distillate which has not as yet been gaged.

The gas is sweet, and has a heat value of 1,190 B.t.u. The well was produced from 91 ft. of zone in the Wasatch formation, in the interval 4,953 ft. to 5,325 ft.

In addition to the 91 ft. tested, the well has, according to the electric-log interpretations, an additional total of 222 ft. of favorable hydrocarbon-bearing high-porosity formation at shallower depths which has not been tested as yet and, in the opinion of the engineers, should greatly add to the producible reserves when included. The unit area in which Well 1 is located consists of approximately 30,000 acres, and the results of the well give indication that a discovery of major importance may have been made.

ALBERTA

GMG 7-9-19-14 Brooks, LSD 7, 9-19-14w4. Blairmore oil discovery. TD 3,482 ft.

Hudson's Bay 10-16-31-28 Olds, LSD 10, 16-31-28w4. Basal Quartz oil discovery. TD 8,056 ft.

McCarty & Coleman 1-21-4+4-13 Killam, LSD 1, 21-44-13w4. Basal Blairmore oil discovery. TD 3,101 ft.

SASKATCHEWAN

Devon Palmer Bishop 15-33-6-9 Viewfield, LSD 15, 33-6-9w2. Mission Canyon oil discovery. TD 4,475 ft.

Highwood Vanalta 10-11-31-22 Gleneath, LSD 10, 11-31-22w3. Viking gas discovery. TD 2,304 ft.

CALIFORNIA

Kern County: Shell Oil Co. 44-36 "KCL," SE NW 36-11n-21w, 360 BOPD, 2.6% cut, 21/64-in. choke, 61 M.c.f., perfs. 8,980-9,658 ft. and 9,703-9,793 ft., TD 10,473 ft. (New field discovery ¾-mile south of Pleito Ranch field).

Kern County: Richfield Oil Corp. 81-8 "KCL H," NE NE 8-11n-21w, 309 BOPD, 29° gravity, 3% cut, 1½-in. choke, 3,250 M.c.f., perfs. 11,491-11,385 ft., TD 11,884 ft. (First extension test in San Emideo Nose field ½ mile northwest of discovery).

Hill's Specialty: Finding Oil

YOU CAN'T argue with success.

That axiom is virtually tailor-made to describe Mason L. Hill, manager of exploration for Richfield Oil Corp.

Despite Hill's modest, sincere disclaimers of any personal credit for Richfield's excellent exploration successes in recent years, the fact remains that Hill was always directly involved in the geological work leading to important Richfield finds.

He's guilty by association, if nothing else.

But, of course there's plenty "else."

Why has Richfield been able to score repeatedly with wildcats in California where other firms have shown increasing disinterest because of the shrinking exploratory prospects?

"We are always willing to try again in an area abondoned by others if there's even a remote shred of encouraging evidence existing," Hill explains.

"It's a matter of optimism and persistence," Hill adds.

"We also have an understanding management; they don't fire us if we get a dry hole," he adds jokingly.

Mason L. Hill
Persistent and optimistic

The payoff . . . The persistency and optimism which Hill speaks of has led to highly rated discoveries in recent years.

Names such as Wheeler Ridge, South Cuyama, North Tejon, and San Emidio in California, coupled with the Swanson River discovery in Alaska and Bellshill and Bone Creek fields in Canada, testify to Richfield's successful policies.

In addition to the Richfield discoveries, all of which Hill was directly involved in, geologically, the personable Hill also figured in the discovery of the Capitan field in California during an early association with Shell Oil Co.

Hill and Richfield have some pretty interesting ideas on the type of geologists they want.

"We try to hire California people, and we prefer plain geologists. We want men who are geologists first and foremost, and oil geologists second. We can train a geologist in the special field of petroleum geology."

A 24-hour-a-day geologist . . . With Hill, geology is a vocation, avocation and a hobby.

A native Californian, he got his feet wet in geology right in his home town of Pomona. He graduated from Pomona College in 1926 with an AB in geology. Several years later he got his Master's degree from Claremont Graduate School. In 1932 he obtained a Ph.D in geology from the University of Wisconsin. His various degrees were punctuated by brief employment stints with Shell Oil Co., mostly in California's coastal regions.

▶ ▶ ▶ Personals

J. N. Gray, petroleum consultant, has moved his office from Olathe, Colo., to Denver.

James Bigard, tool pusher for Calvert Drilling, Inc., has been transferred to Williston, N. D., from Olney, Ill.

Dr. Hendrik J. Morsman, former process superintendent for Great Northern Oil Co. at St. Paul, Minn., has joined George Armistead & Co. as assistant manager of the Athens, Greece, office. Armistead & Co. is acting as technical advisor to the Greek Government, which is building refinery in Athens. Morsman will k with administrative and eco- ic features of refinery operation.

Robert S. Moehlman has been appointed chairman of the finance committees for Austral Oil Co., Inc., and Austral 1959 Corp. for Oil Exploration. Austral Oil formerly was known as Austral Oil Exploration Co., Inc. Austral 1959 was organized recently to carry out a 1-year exploration program. **C. W. Leisk** was named executive vice president, member of the board, and member of the executive committee of the two Houston-based companies. **Dr. James H. McGuirt** is vice president and head of the geological department for both companies. Other top officials, as announced by Austral president **R. McLean Stewart,** include **Thomas Brennan,** vice president; **Paul R. Cole,** vice president and comptroller; and **Eugene H. Dobbs,** chief landman.

William S. Bond, Laurel, Miss., attorney, has been appointed a member of the State Oil and Gas board by **Gov. J. P. Coleman.** He succeeds **Joe Dale.**

William J. Haynes has been promoted to district production foreman in Shell Oil Co.'s Bakersfield, Calif., office. **Donald R. Lindsay,** development engineer with Shell, has been transferred to Farmington, N. M., from Los Angeles. **Bernard J. Perry** has been moved from Calgary to the Los Angeles office as senior development engineer. In other Shell changes on the West Coast, **Gerald E. Pfenning,** drilling foreman in Ventura, Calif., has been transferred to Bakersfield as district drilling foreman, and **Leo L. Sargent,** drilling foreman, has been transferred to South Mountain in Ventura County from Bakersfield.

E. B. Cole, geologist with Cities Service Oil Co. in Calgary, has been transferred to Wichita Falls, Tex., as district geologist. He succeeds **E. E. Tisdale,** who recently was named district geologist in Billings, Mont. Cole will be succeeded in Calgary by **B. C. McCasland,** who recently returned from an assignment in Algeria.

Andrew G. Alpha has been transferred by Signal Oil & Gas Co. from Denver to Los Angeles as exploration coordinator. Alpha joined Signal in Denver in 1953 as geologist from the Rocky Mountain area and Canada. He is currently president of the Rocky Mountain Association of Geologists.

Irving G. Usher, assistant to the vice president, supply and transportation, for Standard Oil Co. of California, Western Operations, Inc., has been appointed assistant manager of the distribution department. Usher has been with the company since 1923.

Also during that time, he put in a hitch in gold mining in the San Bernardino mountains in Southern California.

He joined Richfield in 1937 as Ventura division geologist. In 1939, he moved to Bakersfield as assistant to Division Geologist Rollin Eckis, now Richfield's executive vice president. In 1942, he succeeded Eckis in Bakersfield when Eckis was transferred to the home office in Los Angeles as chief geologist for Richfield.

In 1950, Hill came to Los Angeles, again as Eckis' chief assistant. In 1954, he was named chief geologist and in 1957 was elevated to his present post of manager of Richfield's exploration department.

Hill describes his main hobby as "earthquakes." He's not kidding. Hill is recognized as a leading authority on faults, particularly in the study and classification of California's infamous San Andreas fault. This, and allied faults, have been responsible for the devastating tremors in San Francisco, Long Beach, and in recent years at Bakersfield and Tehachapi.

Hill lives in neighboring Whittier. Two of his five sons graduated from Pomona College and one is attending there now. The son now in college is following in his father's footsteps. He's a geology major.

Dallas Jennings, manager of Esso Standard Oil Co.'s lubricants and specialties division, has retired. Jennings joined Esso in 1916 as a chemist. For many years he was head of the products group, manufacturing department, for the company. He was Esso's representative on aviation matters with the Petroleum Administration for War during World War II and he served until retirement as chairman of the aviation fuels supply subcommittee of Standard Oil Co. (N. J.). He was also a member of Jersey Standard's world-wide supply committee. He was the developer of Esso's products specifications system.

Robert E. Warrick of Clare, Mich., has been appointed drilling superintendent of Bernhardt Drilling Co., Detroit. He succeeds **Vern East.**

George L. Bruno has been named assistant chief engineer of Bechtel Corp.'s refinery and chemical division in San Francisco. He moves to San Francisco from New York where he was supervisor of engineering activities of Bechtel Associates. He has been with the company since 1943.

Ervin Lamb, a recent graduate of the University of Minnesota, has joined the Michigan Department of Conservation in the Mount Pleasant district land division. He succeeds **Richard Swain,** who has resigned.

Dr. Judson L. Anderson has joined Chemical Corn Exchange Bank, New York, as geologist and engineer. Anderson was formerly chief geologist and engineer in the Gulf Coast and assistant to the vice president in charge of gas procurement for Columbia Gas System. He was professor of geology at Johns Hopkins University at one time and has also been with Lago Petroleum Corp. of Venezuela, International Petroleum Co. of Colombia and Peru, and Sinclair Oil Corp. in Southwest Africa.

O. D. Horne has retired as training supervisor for Continental Oil Co. He has been with Continental and its predecessor, Marland Refining Co., since 1922 and was formerly assistant chief chemist in the control laboratory and supervisor of the lube division.

Bani R. Banerjee has been appointed a senior project physicist at the Whiting, Ind., research laboratory of Standard Oil Co. (Ind.). He has been with Indiana Standard since 1951. **James R. Stephens** and **Katashi Oita** have been named project chemists at Whiting. Also, **Robert H. Ossyra** has been named project chemical engineer at the company's Seymour, Ind., laboratories.

DUNAWAY

D. C. Dunaway, former president of Standard Oil Co. of Argentina, has been elected president of American Independent Oil Co. He succeeds **Ralph K. Davies,** president since 1947, who will become chairman of the board. Dunaway and **B. I. Graves,** San Francisco consultant, have been named directors of the company. Graves is a former vice president of Tidewater Oil Co. Their appointment brings board membership up from 15 to 17.

Val T. Billups, executive vice president and a director of Texas Gulf Producing Co., has retired. Billups was with Shell Oil Co. before joining Texas Gulf Producing in 1942. He served as vice president in charge of the land and exploration departments before becoming executive vice president in 1953.

▶ ▶ ▶ Personals

BEALE

A. F. Beale, Jr., assistant laboratory director in Tulsa for Dowell division of Dow Chemical Co., has been named director of chemical research in the company's new chemical research department. **G. L. Foster,** group leader in the Tulsa laboratory, has been named assistant laboratory director, succeeding Beale. Beale joined Dowell in 1953 and Foster in 1952. The company has also announced several changes in the Kansas area. **J. C. Thompson,** station manager at Hays, Kans., has been transferred to United Oilwell Service, S.A., in Anaco, Venezuela. United Oilwell is an affiliated company. **H. D. Monical,** service engineer in Winfield, Kans., has been transferred to Hays to succeed Thompson. **James R. Day,** formerly in Maracaibo, Venezuela, has moved to Winfield as service engineer. Also, **John White** has been transferred from Derby, Kans., to Eureka, Kans., as service engineer.

Jim Stephenson, Humble Oil & Refining Co. district superintendent, has been transferred to Liberty, Tex., from Hardin, Tex.

L. D. Phillips, area superintendent in Weimar, Tex., for Tidewater Oil Co., has been transferred to Houston as district gas supervisor there.

Everett Wing, formerly tool pusher with Exploration Drilling Co. in Odessa, Tex., has joined Sharp Drilling Co. in Tioga, N. D., in the same capacity.

J. A. Kaniue, district superintendent for Mid-Continent Pipe Line Co., has been transferred to Maysville, Okla., from Velma, Okla.

Add L. Rogers, chief inspector for Pacific Northwest Pipeline Corp., has been transferred to Kemmerer, Wyo., from Coeur D'Alene, Idaho.

Watson W. Wise, owner of Wise Operating Co., Tyler, Tex., has been sworn in as a member of the United States delegation to the United Nations General Assembly.

George R. Wells, assistant division petroleum engineer for The Texas Co. in Los Angeles, has been promoted to division petroleum engineer and transferred to Denver.

▶▶▶ Personals

CLARK

Glenn W. Clark, president of Mississippi River Fuel Corp., has been elected president of the Independent Natural Gas Association of America. Clark was first vice president of INGAA during the past year. He succeeds **J. J. Hedrick,** president of Peoples Gas Light & Coke Co. Clark was president of Cities Service Gas Co. and Cities Service Gas Producing Co. before being named head of Mississippi River Fuel in 1956. He was elected INGAA president at the association's annual meeting in New Orleans last week. **W. E. Mueller,** president of Colorado Interstate Gas Co., was elected vice president.

Peter H. Gardett, consulting geologist and **John T. Isberg,** Superior Oil Co., have been nominated for 1959 president of the Pacific section of American Association of Petroleum Geologists. Vice presidential candidates are **Irving T. Schwade,** Richfield Oil Corp., and **Stanley S. Siegfus,** Tidewater Oil Co. **Paul H. Dudley, Jr.,** Humble Oil & Refining Co., and **Bradford K. Johnson,** Ohio Oil Co., are candidates for secretary. **Harold L. Fothergill,** Union Oil Co., and **Robert L. Rist,** Monterey Oil Co., have been nominated for treasurer.

Paul D. Bushong, Jr., petroleum engineer with Magnolia Petroleum Co., has been transferred to Houston from Healdton, Okla.

P. W. McFarland, Latin American division chief geologist for Sun Oil Co. in Caracas, has been appointed exploration manager there. **L. C. Smith,** assistant chief geologist, has moved up to succeed McFarland. In other appointments in this division, **L. M. Rucker,** district paleontologist, has been promoted to regional paleontologist. **J. A. Waller,** district geophysicist, has become division geophysicist. **R. C. Weart,** formerly in Sun's Dallas laboratories, has been transferred to Caracas as research geologist. In Venezuelan Sun Oil Co., a subsidiary, **C. E. Lehecka,** formerly district geologist, has been named regional geologist in Caracas. **J. D. Taylor,** geologist, has been promoted to Maracaibo district geologist. **D. W. Simmons,** geologist, has become eastern Venezuela district geologist. In Colombian Sun Oil Co., another subsidiary, **E. C. Robinson** has been promoted from geologist to district geologist in Bogota.

Richard J. Ross, formerly with Union Carbide Corp., has joined the research staff of the Whiting, Ind., laboratories of Standard Oil Co. (Ind.). Ross is a graduate of Oberlin College.

Kerryn King, The Texas Co.'s vice president in charge of industrial and public relations, has been elected chairman of the American Petroleum Institute Committee on Public Affairs. King succeeds **Thomas W. Phelps,** manager of Socony Mobil Oil Co.'s economics department. The Committee of Public Affairs assumed all functions of the API's former Oil Information and American Petroleum Industries committees August 31.

Guy B. Hunter, chairman of the board of Quaker State Oil Refining Corp., has been reelected president of National Petroleum Association. Hunter was also reelected treasurer, a post he has held for many years. Other officers named at NPA's recent annual meeting include **Rexford S. Blazer,** Ashland Oil & Refining Corp., first vice president, and **John E. Selden,** South Penn Oil Co., second vice president. **O. P. Keeney,** Oil City, Pa., was elected recording secretary.

PYLE

Howard C. Pyle, president of Monterey Oil Co., has been elected president of American Institute of Mining, Metallurgical, and Petroleum Engineers. He will take office at the AIME meeting in San Francisco in February. Pyle succeeds **Dr. Augustus B. Kinzel,** vice president in charge of research for Union Carbide Corp. **Dr. Joseph L. Gillson,** chief geologist of E. I. du Pont de Nemours & Co., has been named AIME president-elect. He will take office in 1960. Other oil men elected by AIME include **Thomas C. Frick,** Atlantic Refining Co., vice president; and **John S. Bell,** Humble Oil & Refining Co., director. Bell is president-elect of the Society of Petroleum Engineers of AIME.

J. W. W. Whitney, Jr., chief production engineer for White Eagle Oil Co., Tulsa, has been promoted to general production superintendent. Whitney was with Magnolia Petroleum Co. before joining White Eagle in 1955.

GEMMER

R. W. Gemmer has been named senior representative in Billings, Mont., for Carter Oil Co. He takes over responsibilities of **John M. Sprague,** who recently went on leave of absence to become deputy assistant secretary of defense. Sprague had been Carter vice president in charge of manufacturing and marketing in Billings since 1956.

George W. Field, southern division geologist in Houston for Cities Service Oil Co., has been promoted to manager of exploration for the division. He succeeds **H. Ben Cox,** who will retire October 1. Field's appointment sets off a number of changes. **Perry E. Barnhart,** district geologist at Lafayette, La., will move to Houston as southern division geologist. **R. O. Donley, Jr.,** senior geologist at Lafayette, will succeed Barnhart there. Cox, retiring exploration manager in Houston, has been with Cities Service since 1924. He was superintendent of the land department before assignment to Houston in 1953.

W. R. Sorenson, assistant superintendent of The Texas Co.'s Eagle Point Works, Westville, N. J., has been named superintendent of the chemicals division at the company's Port Arthur, Tex., refinery. He succeeds **M. F. Granville,** who was recently named general manager of Texaco's petrochemical department. **Howard Wilson,** assistant supervisor of the process and production division of the refining department in New York, will succeed Sorenson at Eagle Point. **W. K. Savage, Jr.,** assistant superintendent of light oil processing at Port Arthur, has been transferred to New York as assistant supervisor in process and production, replacing Wilson.

Donald M. West, Mobil Oil of Canada, Ltd., has been elected president of the Petroleum Exploration Society of Libya, which recently has been organized in Tripoli. Other officers are **J. Allen Sawyer,** Esso Standard (Libya), Inc., first vice president; **Jacque Canaple,** Cie. des Petroles Total (Libye), second vice president; **Daniel K. Hamilton,** American Overseas Petroleum, Ltd., secretary; **Alex Stoupnitsky,** Cie. Generale de Geophysique, treasurer; **Sam B. Frazier,** Gulf Oil Co. of Libya, director; and **Ronald C. MacLean,** D'Arcy Exploration Co. (Africa), Ltd., director.

Joe Urice, formerly contract representative with Urice Drilling Co., Fort Worth, has joined Arrow Drilling Co. as agent. He will headquarter in Midland, Tex. Urice is a graduate of the University of Oklahoma. He had been with Urice Drilling since 1949. Arrow currently has rigs operating in Oklahoma, Texas, Mississippi, Louisiana, and Wyoming, and seven rigs operating in Canada.

Dr. Robert L. Hellwig has been named head of the engineering section in the new development department of Petroleum Chemicals, Inc. Hellwig was formerly process engineer for Ethyl Corp. **Dr. John W. Sellers,** former research group leader for Columbia Southern Chemical, will head the organic section, development department. **Robert S. Munger,** senior research chemist with Continental Oil Co. before joining Petroleum Chemicals, has been named group leader in the analytical section. **Dr. Richard Seekircher** will be group leader in the chemical section. Seekircher was research chemist with British American Oil Co., Ltd., before joining Petroleum Chemicals.

Frederick W. Richmond, New York financier and industrialist, was named chairman of Houston Oil Fields Material Co. after he bought a substantial block of stock in the concern. **George O'Leary,** a founder of the 30-year-old oil field supply firm and service company, will continue as president. O'Leary said last week that the stock purchased by Richmond was made available by officers of the company. The amount acquired by the new chairman was not disclosed. Other corporate changes include **I. Joseph Lawrence,** a veteran of 23 years with Homco, named executive vice president and chairman of the management committee, and **Huntington T. Jamm,** controller, named secretary-treasurer. Added to the board of directors were **Eliot Janeway,** a publisher; **Horace Ford,** former treasurer of Massachusetts Institute of Technology; **Clarke Simons,** partner in G. H. Walker & Co., investment firm; and **J. Thomas Kenneally,** an associate of the new board chairman.

Home Oil Co., Ltd., has promoted nine men in reorganization of its top management. They include **R. W. Campbell,** named general manager of production and pipelines; **John Carr,** named chief geologist; **W. Lundberg,** production superintendent; and **A. Morrison,** chief petroleum engineer. **M. P. Paulson** has been named operations manager in addition to his duties as chief engineer. **J. H. Hamilton** has been named assistant operations manager. **Ian Drum** will be manager of special projects. **M. C. Govier,** former comptroller, has been named secretary-treasurer. **Ross Phillips** has been appointed chief comptroller and chief accountant. Two Home Oil executives, **B. W. Gillespie,** vice president in charge of exploration, and **J. W. Hamilton,** secretary, will retire later this year. Gillespie will continue as a consultant to the company. **John Scrymgeour,** formerly executive vice president of Home Oil, and **W. H. Atkinson,** formerly treasurer, recently resigned to become independent operators.

David Heintz, geologist, and **William McKay,** petroleum engineer, have been transferred from Aurora Gasoline Co.'s Kansas production division to the Michigan division.

E. J. Stufflebeam, tool pusher with Big Chief Drilling Co., has been transferred to Pauls Valley, Okla., from Homer, La.

R. L. Sumerwell, mechanical engineer, has been transferred to Roswell, N. M., from Kilgore, Tex., by Shell Oil Co.

▶ ▶ ▶ Personals

I. Hayden Hughes, administrative vice president of Sunray Mid-Continent Oil Co., has resigned to join Pan American International Oil Co. as general manager of operations in Argentina. Hughes joined Mid-Continent Petroleum Corp. shortly before Mid-Continent merged with Sunray Oil Corp. in 1955. He was assistant to the vice president and manager of production before being named administrative vice president in 1956. Before joining Sunray he was with International Petroleum Co., Ltd., subsidiary of Standard Oil Co. (N. J.), as assistant general manager of operations in Colombia, field manager of Peru, and production coordinator in the International head office, Coral Gables, Fla. Hughes is a graduate of the University of Oklahoma.

Dr. H. G. Schutze has been promoted to research associate at Humble Oil & Refining Co.'s research and development division in Baytown, Tex. **R. N. French** has been promoted to senior mechanical engineer in the technical division at Humble's refinery there.

▶ ▶ ▶ Deaths

W. C. Windsor, Sr., 67, Tyler, Tex., independent, died September 10 at his farm near Boonville, Mo. Windsor nad been active as an independent since 1923. He was head of the land department for Humphreys Oil Co. before that time. He was a director of the Mid-Continent Oil and Gas Association and a former vice president of the Texas Independent Producers and Royalty Owners Association. He was chairman of the Texas Prison Board from 1946 to 1952.

Joseph St. G. B. Nolan, retired chairman of Vacuum Oil Co. of South Africa and Standard-Vacuum Refining Co. of South Africa, died September 7 in Cape Town, South Africa. Nolan was at one time Standard-Vacuum Oil Co.'s area manager in New York for southern Africa. He became managing director of Vacuum Oil of South Africa in 1950 and general representative for all Stanvac interests in southern Africa in 1954. He retired in February 1958.

Millard H. Poole, 53, manager of Sun Oil Co.'s Ohio Valley sales region, died September 11 in a Cincinnati hospital after a heart attack. He had been with Sun since 1922.

Clarence McFaull, Bastrop, Tex., operator, died of a heart attack September 5 while en route to Smithville, Tex.

Charles D. Orcutt, 72, pioneer Tulsa area drilling contractor, died recently in Peabody, Kans.

Harry Leonard, 76, New Mexico independent operator and founder of Leonard Oil Co., Roswell, N. M., died September 13. Leonard was a pioneer in the New Mexico oil industry. He was one of the organizers of the New Mexico Oil and Gas Association, which he served for many years as secretary-treasurer. He was a charter member of the Independent Petroleum Association of America and served on its executive committee.

Take stock drops with grain of salt

BY JOHN C. CASPER

CRUDE STOCKS didn't drop as much in recent weeks as indicated by reports of the Bureau of Mines.

The bureau showed a reduction of 3,317,000 bbl. for week ended August 30 followed by a cut of 4,416,000 bbl. for week ended September 6. That was a 2-week drop of 7,733,000 bbl.

Any stock change represents the difference between supply and demand. Demand for crude wasn't 7,733,000 bbl. more than supply for the above 2 weeks.

Crude supply includes domestic production and crude imports. Weekly crude production reports are not final, but as a rule the variation from actual has been small.

According to the weekly reports, crude production averaged 6,957,000 bbl. daily for the 2-week period. Crude imports amounted to 873,000 bbl. daily for a new-supply total of 7,830,000 bbl. daily.

Demand for crude includes crude runs at refineries, crude exports, transfers to fuels, and losses. Refinery runs averaged 7,960,000 bbl. daily for the 2 weeks. Crude exports, transfers, and losses have been running about 100,000 bbl. daily. Therefore, total crude used was about 8,060,000 bbl. daily.

Since the supply was only 7,830,000 bbl. daily, 230,000 bbl. daily had to come out of storage. For the 14-day period, this would account for a crude-stock drop of 3,220,000 bbl. This calculated stock reduction is about 4,500,000 bbl. less than the 2-week drop reported by the bureau.

Crude stocks may be down to 243,000,000 bbl., but some of the withdrawals took place earlier in the summer. The story is shown in the chart.

During periods of either increasing or decreasing crude stocks, the bureau's weekly figures lag a few weeks behind actual changes reported monthly. Last year, crude stocks climbed 33,000,000 bbl. from the end of March to the end of July. At the end of May, the crude total shown on the weekly report was about 7,000,000 bbl. less than the final figure reported on a monthly basis.

This year has shown the reverse picture. Crude stocks dropped sharply from February through June. Again, the weekly figures lagged, but since stocks were going down, the stock totals reported weekly were too high.

The weekly stock reports also showed a gain of 2,000,000 bbl. from July 26 to August 23, while the calculated stock change indicates a drop of about that much.

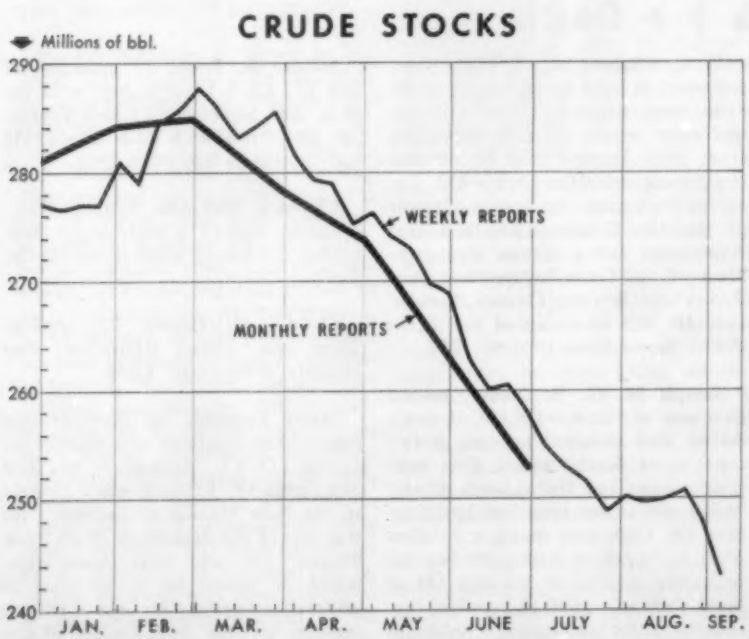
Reported stocks for August 23 probably were about 5,000,000 too high. This indicates that the 7,733,000-bbl. drop, reported for following 2 weeks, included a big correction factor.

Gasoline markets . . . Gasoline continues to show more than end-of-season weakness. Price wars are increasing on the East Coast. The Chicago bulk market is so low that Mid-Continent refiners can't ship to the area without taking a sharp cut below the normal Group 3 price.

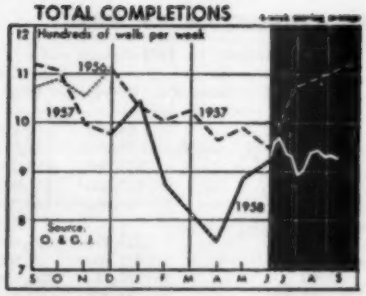
Gasoline stocks are at about last year's level, but stocks were too high last year and the year before. In recent weeks, refiners have been making about 2% more gasoline per barrel of crude run than last year.

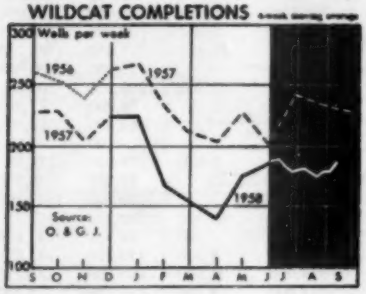
A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,034,050	DOWN	29,400	UP	163,814
Crude stocks	243,308,000	DOWN	4,416,000	DOWN	39,174,000
Completions	962	UP	18	DOWN	95
Refinery runs	7,845,000	DOWN	137,000	DOWN	211,000
Gasoline stocks	172,891,000	DOWN	1,610,000	DOWN	914,000
Kerosine stocks	29,651,000	UP	786,000	DOWN	6,350,000
Distillate stocks	146,049,000	UP	3,840,000	DOWN	16,804,000
Residual stocks	68,378,000	UP	296,000	UP	13,195,000
Four-product stocks	416,969,000	UP	3,312,000	DOWN	10,873,000
Total imports	1,276,500	DOWN	114,400	DOWN	56,000



WEEKLY REPORTS of crude stocks are too high when stocks are going down and too low when stocks are going up.





Active Rotary Rigs*

ACTIVE ROTARY RIGS*	9-15-58	9-8-58	9-16-57
Alabama	5	5	4
Arkansas	23	21	25
Arizona	2	2	1
California	75	70	96
Colorado	35	47	65
Florida	1	1	1
Georgia	....	....	....
Idaho	....	....	....
Illinois	62	53	67
Indiana	6	12	11
Iowa	3	3	2
Kansas	156	146	151
Kentucky	8	6	12
Louisiana	310	304	450
North	38	39	62
South	235	228	285
Offshore	37	37	103
Maryland	....	....	1
Michigan	10	10	11
Missouri	1	1	....
Montana	20	20	30
Mississippi	46	45	38
Nebraska	25	25	34
Nevada	....	....	....
New Mexico	95	99	149
New York	2	2	....
North Dakota	32	30	39
Ohio	1	1	....
Oklahoma	223	218	271
Oregon	....	....	1
Pennsylvania	9	9	13
South Dakota	3	3	2
Texas	681	692	908
South-Gulf	141	133	203
Offshore	1	....	2
North-East	174	176	(†)
West Central	210	224	(†)
West	155	159	(†)
Tennessee	....	....	1
Utah	31	30	67
Washington	....	1	1
West Virginia	2	4	4
Wyoming	69	61	79
Virginia	....	....	1
Total U. S.	1,936	1,921	2,535
Western Canada	153	148	208
Eastern Canada	4	3	3
Grand total	2,093	2,072	2,746

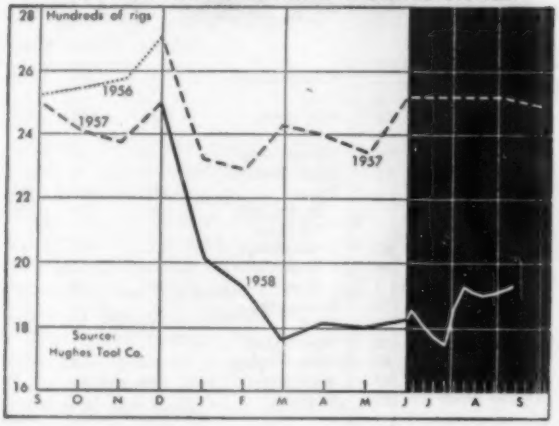
*Hughes Tool Co. †Comparisons not available due to change in method of reporting.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 13, 1958

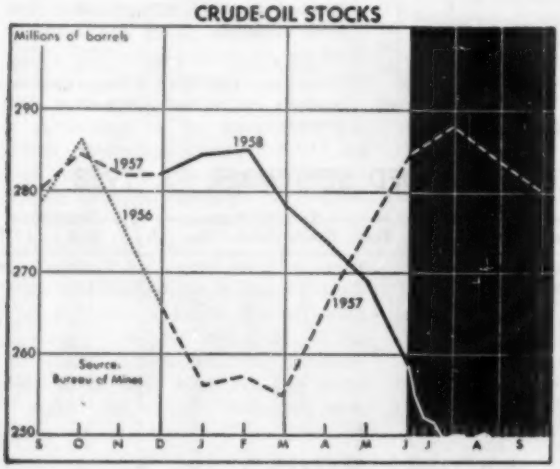
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	1	0	0	0	1	0	1,600	51	63	1	0	0	0	1	20	20
Arkansas	18	8	0	2	8	0	67,838	522	784	2	0	0	0	2	114	140
California	21	13	0	0	8	0	100,715	1,119	1,519	7	2	0	0	5	263	372
Colorado	9	0	0	0	9	0	47,391	561	599	7	0	0	0	7	327	403
Illinois	42	16	0	0	26	0	94,077	1,494	1,811	15	3	0	0	12	302	446
Indiana	17	7	0	0	10	0	28,792	522	457	3	1	0	0	2	186	92
Kansas	73	37	0	2	30	4	257,538	2,620	2,968	12	1	0	0	11	556	594
Kentucky	24	10	0	1	13	0	36,960	803	1,026	3	1	0	0	2	101	212
Louisiana	68	34	9	4	21	0	467,555	2,391	2,655	9	1	2	0	6	347	473
North	28	18	0	3	7	0	85,093	864	954	3	1	0	0	2	142	128
South	35	11	9	1	14	0	33,418	1,211	1,220	6	0	2	0	4	185	287
Offshore	5	5	0	0	0	0	51,044	316	481	0	0	0	0	0	20	58
Michigan	9	1	0	0	6	2	18,630	291	296	5	0	0	0	5	96	107
Mississippi	5	2	1	0	2	0	39,574	269	270	2	0	0	0	2	123	141
Montana	5	5	0	0	0	0	36,651	232	284	0	0	0	0	0	96	105
Nebraska	14	5	0	0	9	0	87,955	494	612	6	0	0	0	6	230	340
New Mexico	19	6	0	6	7	0	95,580	1,369	1,500	5	0	0	0	5	185	200
West	7	0	0	6	1	0	35,790	659	612	0	0	0	0	0	76	75
East	12	6	0	0	6	0	59,790	710	888	5	0	0	0	5	109	125
New York	10	5	0	0	0	5	13,500	391	326	0	0	0	0	0	37	6
North Dakota	14	8	0	0	6	0	83,212	326	185	4	0	0	0	4	106	79
Ohio	17	9	0	4	3	1	47,011	742	777	0	0	0	0	0	12	9
Oklahoma	126	68	1	4	48	5	380,763	4,457	4,418	16	0	0	0	16	611	505
Pennsylvania	58	17	0	26	8	7	184,292	438	473	5	0	0	1	4	14	39
Texas	362	165	4	32	150	11	1,412,037	12,562	15,387	84	9	3	1	71	2,560	3,730
District 1	16	9	0	0	7	0	30,311	674	882	5	0	0	0	5	270	307
District 2	17	2	1	4	10	0	97,830	528	535	5	0	1	1	3	139	197
District 3	38	14	0	0	24	0	212,376	909	1,220	7	0	0	0	7	202	351
District 4	23	6	1	1	15	0	115,422	838	998	7	0	1	0	6	246	333
East	22	8	1	1	12	0	92,393	854	926	7	0	0	0	7	236	269
District 7-B	39	12	0	0	26	1	113,483	1,710	2,035	15	2	0	0	13	483	710
West	100	77	1	0	19	3	447,573	3,622	4,355	19	4	1	0	14	506	623
District 9	73	30	0	5	31	7	184,066	2,527	3,425	16	3	0	0	13	404	865
District 10	34	7	0	21	6	0	118,583	900	1,011	3	0	0	0	3	74	75
Utah	8	7	0	0	1	0	41,720	276	145	1	0	0	0	1	59	75
West Virginia	10	1	0	7	2	0	31,665	502	471	0	0	0	0	0	12	21
Wyoming	29	12	0	1	16	0	101,460	516	605	10	0	0	0	10	153	207
Mo., Wash., Tenn.	3	1	0	1	1	0	7,095	67	99	2	0	0	1	1	57	82
Total U. S.	**962**	437	15	90	385	35	3,683,612	33,015	37,730	**199**	18	5	3	173	6,567	8,398
Prev. week	944	453	24	66	378	23	3,723,996	.....	.....	192	13	2	3	174	.....	.....
Cum. 1958	33,015	16,186	806	2,529	12,643	851	136,969,046	.....	.....	6,567	638	113	191	5,626	.....	.....
Western Canada	43	26	0	3	13	1	226,152	1,717	2,131	16	4	0	1	11	464	596

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	9-6-58	8-30-58	9-7-57
Pennsylvanian	2,887	2,954	3,230
Other Appalachian	1,408	1,431	1,667
Illinois, Indiana, Michigan	10,806	10,653	11,186
Nebraska and North Dakota	1,971	2,244	2,413
Kansas	9,033	9,335	10,392
Oklahoma	16,077	15,407	21,650
Arkansas	1,912	1,733	2,727
Louisiana	15,871	16,767	18,966
North	2,685	2,886	3,144
South	13,186	13,881	15,822
Mississippi, Alabama, Florida	2,539	2,624	2,607
New Mexico	8,092	7,826	9,797
Texas	99,769	101,895	126,524
East Texas	7,856	7,895	10,332
West Texas	49,062	50,153	60,273
Texas Gulf	17,867	17,977	23,754
Other Texas	24,984	25,870	32,165
Wyoming	13,445	‡13,663	17,008
Other Rocky Mountain	9,041	8,846	6,324
California	35,952	36,792	30,684
Foreign	†14,505	15,554	17,307
Total	**243,308**	‡247,724	282,482

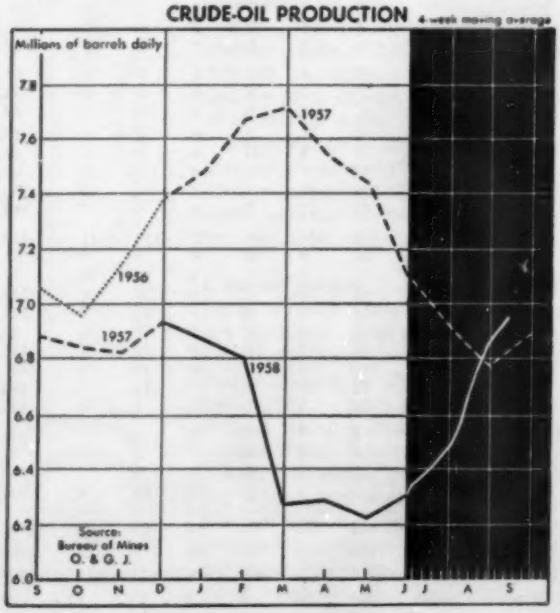
*Bureau of Mines. †Includes 5,244,000 bbl. in California. ‡Revised.

DAILY AVERAGE PRODUCTION FOR WEEK

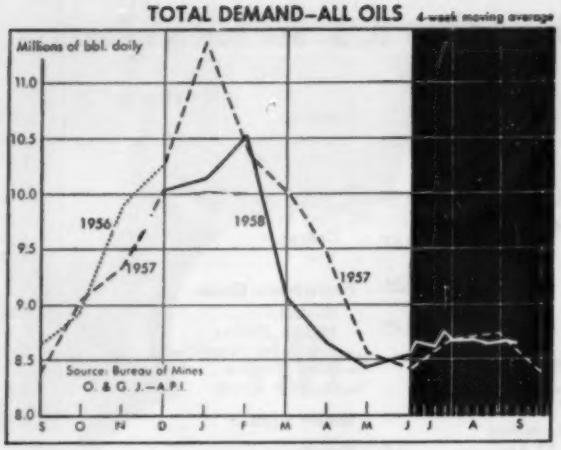
	September 13, 1958			Sept. 6
	Crude oil	Lease condensate	Total	total
Alabama	14,950	.....	14,950	16,175
Arkansas	73,450	200	73,650	73,325
California	853,200	.....	853,200	854,000
Colorado	132,000	.....	132,000	131,900
Eastern	45,000	.....	45,000	46,200
Florida	1,225	.....	1,225	1,225
Illinois	223,000	.....	223,000	223,400
Indiana	32,500	.....	32,500	32,500
Kansas	†309,750	.....	†309,750	†346,650
Kentucky	41,000	.....	41,000	40,900
Louisiana	796,350	86,050	882,400	873,650
North	106,350	2,600	108,950	108,925
South	690,000	83,450	773,450	764,725
Michigan	25,100	.....	25,100	24,700
Mississippi	102,900	3,800	106,700	105,300
Montana	76,800	.....	76,800	77,000
Nebraska	57,800	.....	57,800	58,600
Nevada	100	.....	100	100
New Mexico	274,000	5,100	279,100	278,600
North Dakota	33,500	.....	33,500	38,700
Oklahoma	†526,200	.....	†526,200	†587,600
Texas	2,827,000	63,500	2,890,500	2,823,350
Dist. 1	48,000	500	48,500	47,650
Dist. 2	128,000	8,300	136,300	132,875
Dist. 3	374,000	31,500	405,500	387,225
Dist. 4	213,000	8,100	221,100	215,100
Dist. 5	34,000	375	34,375	33,800
Dist. 6	130,000	6,100	136,100	132,375
East Texas Field	166,000	.....	166,000	163,275
Dist. 7-B	155,000	75	155,075	151,350
Dist. 7-C	145,000	4,050	149,050	145,050
Dist. 8	1,115,000	2,000	1,117,000	1,097,000
Dist. 9	212,000	1,500	213,500	211,225
Dist. 10	107,000	1,000	108,000	107,425
Utah	102,600	.....	102,600	103,200
Wyoming	326,800	.....	326,800	326,200
Others	‡175	.....	‡175	‡175
Total U. S.	6,875,400	158,650	**7,034,050**	7,063,450
Change from prev. week, down			**29,400**	
Canada	†369,600	.....	†369,600	†436,232
Total U. S. production—Jan. 1-Sept. 13				1,673,384,125 bbl.
Same period last year (crude plus cond.)				*1,868,272,557 bbl.

*Includes 35,808,680, bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

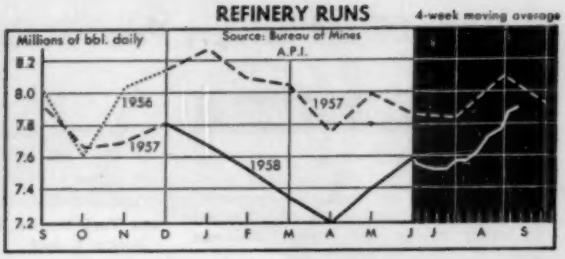
CRUDE-OIL PRODUCTION 4-week moving average



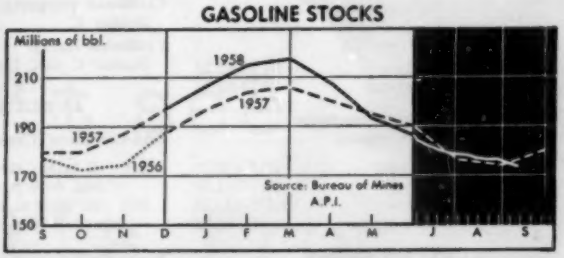
TOTAL DEMAND—ALL OILS 4-week moving average



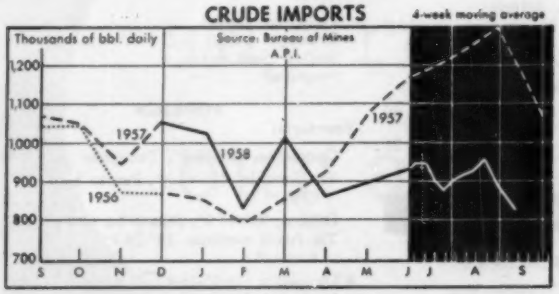
REFINERY RUNS 4-week moving average



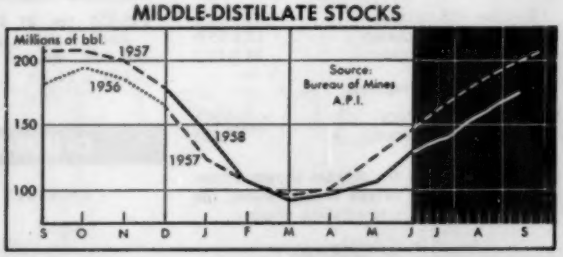
GASOLINE STOCKS



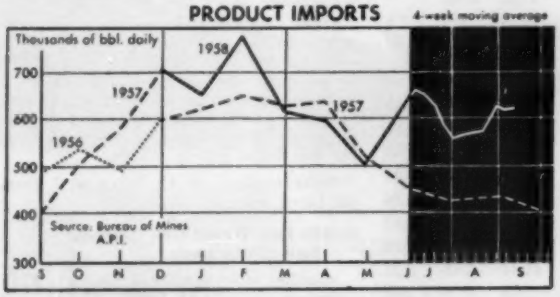
CRUDE IMPORTS 4-week moving average



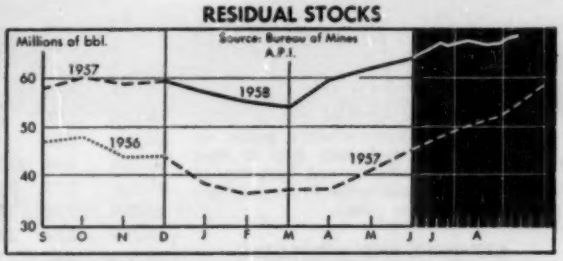
MIDDLE-DISTILLATE STOCKS



PRODUCT IMPORTS 4-week moving average



RESIDUAL STOCKS



API REFINERY REPORT—SEPTEMBER 12, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1957 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist	Resid.
East Coast ...	1,102	504.9	24.3	308.9	206.3	38,672	10,872	50,261	13,111	1,170	513.8	20.7	308.1	193.9
Appalachian:														
District 1	105	47.1	3.6	21.0	8.1	4,262	557	3,199	320	108	47.2	2.3	25.1	6.5
District 2 ..	103	56.1	6.4	25.3	8.0	2,383	523	1,394	224	101	53.4	6.0	16.8	9.6
Ind., Ill., Ky. ..	1,322	723.7	53.6	306.7	114.6	32,755	7,516	26,003	5,796	1,409	729.5	63.0	290.3	162.3
Minn., Wis., Dak.	82	36.1	1.1	22.0	10.0	7,065	1,506	8,369	560	61	25.1	1.6	20.2	7.0
Okla., Kans., Mo.	691	401.0	7.9	179.1	40.9	16,786	1,847	13,299	946	704	413.9	13.3	173.6	30.9
Inland Texas ..	286	197.1	8.9	46.7	19.9	6,726	374	1,860	2,006	283	215.9	7.4	52.1	22.7
Texas Gulf Coast	1,871	951.9	108.0	430.3	186.1	22,264	2,763	15,189	8,835	1,891	985.3	111.0	451.0	228.7
La. Gulf Coast ..	679	398.0	72.3	174.9	47.7	9,375	1,913	7,223	1,665	612	368.2	35.2	168.9	49.8
N. La. and Ark.	101	40.9	5.1	22.1	6.1	4,614	1,110	1,670	178	99	38.0	7.4	18.9	6.7
Rocky Mountain:														
New Mexico .	20	14.6	0.1	3.0	1.0	418	17	139	45	25	13.9	0.4	5.2	3.3
Other Rky. Mt.	285	125.3	3.9	57.0	28.7	4,512	283	3,196	863	290	133.1	3.9	65.6	39.2
West Coast	1,198	511.3	3.1	176.6	292.3	23,059	370	14,247	33,829	1,168	525.0	3.9	176.3	338.9
Sept. 12, 1958 ..	7,845	4,008.0	298.3	1,773.6	969.7	172,891	29,651	146.049	68,378	7,920	4,062.3	276.1	1,772.1	1,099.5
Sept. 5, 1958 ..	7,982	4,048.0	245.7	1,785.6	1,007.3	174,501	28,865	142,209	68,082	.....	.....	.....	.....	.....
Sept. 13, 1957 ..	8,056	4,078.0	334.3	1,768.3	1,105.9	173,805	36,001	162,853	55,183	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.75-12.25
Premium (99 octane)	14.75-15.25
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.50-10.75
★ Regular (92 octane)	10.75-11.00
★ Premium (97 octane)	11.875-12.125
★ Premium (98 octane)	12.00-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.3-11.5
Premium (96 octane)	12.8-13.0
Premium (98 octane)	13.3-13.5
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.125

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.50-9.75
Distillate No. 1	9.50-9.75
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.875
Distillate No. 2	8.625
New York Harbor (barges):	
Kerosine 41-43	9.95
Distillate No. 2	9.45
Diesel fuel, 48-52 d.i.	10.05
Caribbean area (cargoes):	
Distillate No. 2	8.625

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.30-1.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.20-2.25
New York Harbor (barges):	
Bunker C fuel	$2.57
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.§	Mid-Cont.*	Gulf Coast Tex..†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.36	....	....	....	....
15-15.9	2.41	....	....	....	$1.81
16-16.9	2.46	....	....	....	1.86
17-17.9	2.51	....	....	....	1.91
18-18.9	2.57	....	....	....	1.96
19-19.9	2.62	....	....	....	2.01
20-20.9	2.68	$2.75	....	$2.62	2.06
21-21.9	2.73	2.77	....	2.64	2.11
22-22.9	2.78	2.79	....	2.66	2.16
23-23.9	2.84	2.81	$3.44	2.68	2.21
24-24.9	2.89	2.83	3.46	2.70	2.26
25-25.9	2.95	2.85	3.48	2.72	2.31
26-26.9	3.00	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	....	3.05	....	2.92	2.83
36-36.9	....	3.07	....	2.94	2.87
37-37.9	....	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40-44.9	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Ville Platte	3.30
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
★ Quiriquire, 16.0°-16.4°, Caripito	2.15
★ Lagunillas heavy, flat, Amuay or Las Piedras*	2.10
★ Bachaquero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-East Coast, clean (USMC Flat)	$2.85
★ Carib.-U.S.N.H., dirty (USMC −50%)	1.35
★ P.G.-Italy, dirty (Scale—52.5%) (22s. 10d.)	3.19
Gulf-U.S.N.H., clean (USMC +15%)	3.28

FAMOUS FALLACIES *about industrial advertising*

We don't see any results from our advertising

John L. Gillis replies to this one...

According to Mr. John L. Gillis, vice-president of marketing, Monsanto Chemical Company: "*Industrial advertising produces results when it puts into people's minds ideas which create a favorable attitude for salesmen to capitalize upon.*"

The specific effect of industrial advertising upon the market can seldom be measured alone.

Because: advertising is only one member of a marketing team which also includes product development, market research, sales control, field engineering and product performance — all reinforcing the work of the salesmen.

Most industrial salesmen today know that their companies' advertising is an invaluable aid to them in selling — particularly the unseen, unsuspected and inaccessible buying "influences" whose "OK" is often vital. These salesmen would be the first to agree . . .

Effective advertising support is one of the most valuable tools in the salesman's kit.

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An organization of over 4000 members engaged in the advertising and marketing of industrial products, with local chapters in ALBANY, BALTIMORE, BOSTON, BUFFALO, CHICAGO, CLEVELAND, COLUMBUS, DALLAS-FORT WORTH, DENVER, DETROIT, HAMILTON, ONT., HARTFORD, HOUSTON, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, MINNEAPOLIS-ST. PAUL, MONTREAL, QUE., NEWARK, NEW YORK, PHILADELPHIA, PITTSBURGH, PORTLAND, ROCHESTER, ROCKFORD, ST. LOUIS, SAN FRANCISCO, TORONTO, ONT., TULSA, YOUNGSTOWN.

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WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone: AXminister 2-0287.

EQUIPMENT WANTED

A COMPLETE SET of API Master Tool Joint Gauges, 2⅜, 2⅞ and 3½ inch. Box K-850, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE PORTABLE PULLING UNIT; maximum depth—1,500 ft., double drum with sand line, bailer sand pump and miscellaneous equipment for tubing and rod pulling; with equipment for bailing and swabbing. Also want No. 1 used pumping units, single cylinder gas engines, electric motors, tanks, heaters and separators. Box K-851, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY good Mayhew 2000 or Failing 2500 rig. Give details, including price and where rig may be inspected. Box K-857, The Oil and Gas Journal, Tulsa, Oklahoma.

WE ARE INTERESTED in purchasing a D-6 Caterpillar or equivalent with side boom. Cat. to be in good operating condition. Write to Roy Gearhart, Box 710, McPherson, Kansas, or telephone 481 at McPherson.

FOR SALE EQUIPMENT

7000 FT. 3½ I.F. modified drill pipe; 4¾ tool joints; elevators; rotary slips; also, 5¾ drill collars. Box 297, Tyler, Texas.

SECOND HAND Mining Equipment, 2 air receivers, compressor 6x7, 15 H.P. gas engine, air hammer, 60 pieces of ⅞ steel, pipes, bolts, valves, belts, fittings, 2 cyclone tilting furnaces, and other equipment. See at 2222 N. Fair Oaks, Altadena, Calif., SY 7-5889.

NATURAL GAS desulphurization plant and six and one-half miles of 3½" welded high pressure line, on top of ground. Located in McMullen County, Texas. Plant will handle 2,000 MCF of sour gas per day, containing up to 800 grains of sulphur per hundred cubic feet, and dehydrate gas to 5 and 6 pounds of water per million cubic feet. Equipment list, specifications and plant layout available on request. Plant and line sold together or separate to highest bidders. Contact Jupiter Oils, Inc., P. O. Drawer 251, Alice, Texas.

NEW PUMPS FOR SALE
2 Gardner-Denver model PL-7 with elec. drive, 250 HP. Price $16,500.00.
3 Aldrich Vertical Triplex, 2¾ x 8, 123.4 GPM @ 2500 psi.
3 Byron-Jackson Cent., Hydropress 15" x 12", 4160' head.
New Silent Chain-Link Belt.
200' 1¼" x 7" $15.00 per foot.
Other sizes in stock: 1½" x 7", 10" and 16"
COOK INDUSTRIES, INC.
Merchantville, N. J.

PROPANE DEASPHALTING UNIT
(1000 BBL. PER DAY)
Complete with 4.6 million BTU per hour gas-fired asphalt furnace, extractor tower, deasphalted oil stripper, asphalt stripper, jet condenser & trap and the necessary storage, flash, blowdown, and fuel drums and exchangers. unit built by M. W. Kellogg Co. in 1950 and retired from service mid 1957.
THE STANDARD OIL CO.
1646 Midland Bldg.
CLEVELAND, OHIO
Mr. W. R. Fisher

FOR SALE EQUIPMENT

1500 FAILING, 42' mast, 3½" kelly, 5 x 8 pump, 55 rig and truck. Long mast, kelly, Franks, 54 truck, 5 x 6 and 5 x 8 pump. Fred Butler, Box 481, Pueblo, Colo.

1—C-250 NATIONAL IDEAL 7¼" x 15" power slush pump driven by General Motors 12103 twin diesel engine. 3—Superior Super P.T.D.-66 diesel drilling engines with twin disc clutches & radiators. O'Neal Taylor & Company, 6102 Harrisburg, Houston, Texas.

T-16 NATIONAL Rotary Rig, complete with 5100' 4½" Drill Pipe; Walker-Neer C-32 Three Drum Spudder, mounted on 1955 International 190 Tandem, complete with all tools; Fred E. Cooper Double Drum Spudder, mounted on tandem axle float, complete with all tools; Wilson Double Drum Well Servicing Unit, mounted on GMC tandem truck, with all tools. This equipment is all in very good condition. Call or write John R. Adams, c/o Foster Drilling Co., Inc., Box 751, Cushing, Oklahoma. Phone CA 5-0274 or CA 5-3914.

CARDWELL ROTARY RIGS
Capacity 1,500' to 10,000'. Immediate delivery. Your chance to buy on liberal terms or lease with option to purchase. Inventories supplied upon request.
CARDWELL INVESTMENT CO., INC.
804 Petroleum Building
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FOR SALE EQUIPMENT

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

8⅝" 28 LB. LAPWELD line pipe, 600,000 ft. No. 1 grade. Indiana-Ohio Pipe Co. P. O. Box 323. Phone 3-4674, Decatur, Indiana.

8" COUPLINGS with Dutchman, A-1 Shape, standard 8 thread line. Indiana-Ohio Pipe Co. P.O. Box 323, Decatur, Ind., Phone 34674.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

NEW LINE PIPE
Prime Grade A.P.I. Spec. 5-L x 52
Electricweld, 40' DRL. Beveled
5500' 20" O.D. x .406 wall 85.01#
2250' 20" O.D. x .375 wall 78.60#
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Moody inspection certificates available
Located: Harvey and New Iberia, La.
Very reasonably priced.
MID-STATES PIPE & SUPPLY CO.
OF LOUISIANA
Phone CHerry 2-7997 Tulsa, Oklahoma

CLEAN UP SALE—BARGAINS GALORE
15 ~~20~~ DAYS TO GO
TIDEWATER OIL CO—DRUMRIGHT, OKLA.

CAT CRACKER EQPT. NEW 1950

9—TOWERS 2'6" to 8' Dia.
2—PETROCHEM Heaters
1—PEABODY Airheater
10—CONDENSERS 170 to 1495 Sq. Ft.
2—REBOILERS 165 & 220 Sq. Ft.
3—CATALYST Bins & Hoppers
1—BAROMETRIC Condenser
11—STEAM PUMPS
2—CENT. PUMPS 3000 GPM 75 psi.
1—PASSENGER Elevator 182'
1—REACTOR 14' x 42'
1—KILN 18' x 55'
1—AIR BLOWER 11,000 CFM.
150—INSTRUMENTS

OTHER ITEMS FROM CAT CRACKER TOO NUMEROUS TO MENTION

OTHER ITEMS

388 BUCYRUS-ERIE Crane & Dragline; 75 ft. Boom, long frame & wide tread cats.
CAT. D6 Tractor 74 in. ga., 16-in. shoes.
CATERPILLAR 112 Grader
210 CFM I-R Compressor Pneu. Tires
8500 GAL. ETHYL Blending Plant
AUTOMATIC Telephone Eqpt.
CROLOY Furnace Tubes New
API Oil Separator
200 TON Used Synthetic Catalyst
1000# GASOLINE Dyes
2700# DuPont Antioxident
40 TON Dusting Gypsum
16 TON Aluminum Sulphate
900—50# PAILS National Foamite

Phone or Wire for Complete Information

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y., MUrray Hill 7-5280
310 Thompson Bldg., Tulsa 3, Oklahoma, Diamond 3-4890
SITE OFFICE—Drumright, Okla., Phone 569

FOR SALE EQUIPMENT

PIPE FOR SALE—A quantity of 16", 18" and 20" O.D. good used pipe at a very low price. Must be sold immediately. Write, wire, or call Tri State Pipe Company, P. O. Box 542, Bellaire, Ohio. Phone ORchard 6-1451.

8⅝" OD—19.64# EW PE Line Pipe, 13,900 feet, 40 and 50 foot lengths. Line new. $1.55 foot at Toronto, Kansas. Box 1215, DI 3-9563, Tulsa, Oklahoma.

HELP WANTED

MECHANICAL ENGINEER—Minimum of 5 years experience petroleum refinery, petrochemicals plant or closely related fields. Must have working knowledge of refinery processes, equipment, utilities and preferably some maintenance background. Good opportunity to grow with a growing organization. Send complete resume and salary requirements to The Vickers Petroleum Company, Inc., Potwin, Kansas, attention Mr. F. W. Macfarline.

COMBINATION general manager, drilling superintendent and petroleum engineer, to supervise foreign one rig operation; top salary and bonus. We want complete background and references. All replies held strictly confidential. Box K-867, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, Petroleum or Natural Gas; or Chemical Engineer with production or refining experience. At the Pennsylvania State University, Administrative staff opening in the educational services program for Pennsylvania industries. Responsibilities include organization of technical classes and supervision of industrial education programs but do not include teaching. Year around work. Some limited travel. Write Employment Division, 304 Old Main, The Pennsylvania State University, University Park, State College, Pennsylvania.

Refinery Management

Must have operating and administrative experience. Chemical or petroleum engineering background helpful. All replies confidential. Salary open. West Coast refinery.

Box 31J404,
The Oil and Gas Journal,
4041 MARLTON AVENUE,
LOS ANGELES 8, CALIF.

OPENING FOR REFINERY SHIFT FOREMAN

Newly constructed oil refinery at Sewaren, N. J. has openings for several shift foremen. Applicants must be experienced in supervising hourly employees working on refinery units and have general knowledge of processing operations and refinery equipment. All information confidential. Salary commensurate with ability and experience. Forward resume to personnel manager indicating work experience, education, and salary requirement.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

HELP WANTED

OPPORTUNITY FOR REFINERY MANAGER

Unusual opportunity at our new Sewaren, New Jersey refinery for a seasoned refining executive who has had at least ten years operating and administrative experience. Must have initiative, drive, and capacity to direct all phases of complete 45,000 B/D refinery operation. Petroleum or chemical engineering background preferred. All information confidential. Salary commensurate with ability and experience. Forward resume describing education, operating experience, and salary requirement to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. BOX 631
PERTH AMBOY, N. J.

REPRESENTATIVE to sell Oil Tool Equipment to drilling companies and refineries. Good territories available. Experienced representatives preferred. Box 31J402, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

GENERAL SALES MANAGER wanted by aggressive petroleum marketing company with headquarters in Tulsa. Must be experienced in sales promotion, well known in the industry and have full knowledge of specifications of petroleum products as well as pricing schedules. Some traveling necessary. Excellent opportunity with chances for advancement for right man. Please reply Box K-855, The Oil and Gas Journal, Tulsa, Oklahoma, giving age, qualifications, references and expected starting salary. All replies will be treated strictly confidential.

OPENINGS FOR REFINERY-INSTRUMENT MECHANICS

Newly constructed independent oil company refinery at Sewaren, N. J. has openings for instrument mechanics. Applicants must be experienced and capable of servicing and maintaining pneumatic, mechanical, electrical and electronic equipment. Send resume to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

Production Superintendent Wanted

BY INDEPENDENT PRODUCER

Job entails supervision of drilling wells, completion of same and routine production operations and requires experience in eliminating and reducing field costs. Job also includes finding and installing waterfloods and substantial experience in this is essential. Office in Tulsa and be in field approximately 50% and office 50%. Salary and incentive plan.

BOX K-865,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

OPENING FOR PROCESS SUPERINTENDENT

New refinery at Sewaren, N. J. has opening for process superintendent. Excellent opportunity for experienced individual who has ambition and ability. Applicant should have ten years refinery operating experience. Chemical engineering education preferred. All replies handled in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education, and salary desired to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. BOX 631
PERTH AMBOY, N. J.

ASSISTANT DISTRICT FOREMAN—Supervision of high pressure gas transmission pipeline construction, maintenance and operation. Engineering background desired with three to five years experience in pipeline work, including supervisory responsibilities. Position offers excellent opportunity for advancement to higher management. Location New England. Send resume of education, experience and salary expected. Box K-848, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITY FOR REFINERY ACCOUNTANT

Opening for refinery accountant. We have an excellent opportunity for senior accountant to be in charge of all refinery accounting. This is an opportunity for experienced accountant who has initiative, ambition, and ability. Applicants should have refinery or similar accounting experience. All replies kept in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education and salary requirement to:

MR. LEON HESS
HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

PALEONTOLOGIST

CALTEX seeks Paleontologist, with following qualifications, for initial assignment to North Africa:

- 3-5 years experience in petroleum industry
- background study of Late Cretaceous and Early Tertiary microfaunas
- Master's Degree in Geology, with specific studies of Paleontology

This interesting and challenging assignment provides a salary commensurate with experience, plus liberal vacation and benefit plans participation. Send detailed resume, including salary requirements and college transcript, to:

Employment Section

California Texas Oil Company, Limited

380 MADISON AVENUE
NEW YORK 17, NEW YORK

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

OPENING FOR
LEAD BLENDER-REFINERY

Independent oil company refinery at Sewaren, N. J. has opening for a gasoline blender. Must be experienced in refinery blending of gasoline, including tetra-ethyl lead, and additive blending. Send resume to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, N. J.

OPENING FOR
REFINERY SUPERVISOR
PLANT PROTECTION AND SAFETY

Experienced refinery safety engineer with ability and capacity to supervise plant security and inaugurate safety program. Position at newly constructed independent oil company refinery at Sewaren, N. J. Send resume indicating experience, education, and salary requirement to personnel manager.

HESS TRADING AND TRANSPORT, INC.
P. O. Box 631
Perth Amboy, New Jersey

SITUATION WANTED

RESERVOIR ENGINEER, 31, married. Ten years of broad, active experience in production management, waterflooding, gas injection, reserve estimation, appraisals, and workovers. Desires responsible position with growing organization. Presently employed with major company. Box K-845, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER. Twelve years experience major companies in process design, project engineering, construction and operation of gas processing and cycling plants, including pipeline facilities. Supervisory experience. Familiar with gas sales and products contracts. Desire position in Texas with medium size company, independent, sales organization or contractor. Box K-852, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER-FLOOD ENGINEER: Graduate engineer, 12-years supervisory experience, field applications, management problems; water-flood, secondary recovery operations; including development, operation, evaluation, unitization, and execution of projects. Interested in increasing production for independent. Married, age 38. Presently employed in Mid-Continent area. Box K-854, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERINTENDENT: Man in early fifties with more than 30 years practical experience in Production and Drilling with major companies desires connection with small, growing Company or Independent Producer. Many years deep and shallow well gas lift and pumping experience. Excellent physical condition. Will consider any location. Box K-859, The Oil and Gas Journal, Tulsa, Oklahoma.

PHOTO-REPRODUCTION SUPERVISOR—thoroughly familiar with the needs of oil companies in photo-reproduction, (all phases), offset duplication, microfilm, microprint. Also qualify as mapping department supervisor. Complete work history on request. Box K-849, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN POSITION DESIRED — Four years reservoir, evaluation and production engineering experience. Box K-868, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER OF DRILLING COMPANY and former operations Manager for oil company, desires challenging position. 24 years foreign and domestic experience. Box K-866, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

PETROLEUM ENGINEER: Graduate, registered, 35, ten years experience, geology and well completion, production, evaluation, secondary, Manager. Desire responsible position with aggressive Mid-Continent independent. Box K-863, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED Petroleum Engineer: B.S., 33, 7 years experience; production, waterflooding unitization, evaluation. Box K-864, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - GEOPHYSICIST, 30, B.A. Math, M.S. Geology, 6 years interpretative experience with major, desires position with consulting or small oil firm with exploration department. Detailed resume on request. Box K-830, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN-LAWYER — wide experience federal oil, gas problems Washington, D. C., seeks to represent oil company in Washington. Box K-856, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—35, registered, seven years production engineering Gulf Coast, West Texas, and Mid-Continent. Desires work in production and/or completion with small, active organization. Box K-860, The Oil and Gas Journal, Tulsa, Oklahoma.

COMMAND PILOT: 4,525 multi-engine hours. Rating: commercial-instrument. Most recently employed as jet test pilot for Douglas. Graduate, M.A. degree. Foreign flying experience. Howard McHenry, 1539 So. Gary, Tulsa.

MECHANICAL ENGINEER

6 years' sales experience: exploration, drilling, and production, two years management experience, geographically flexible, recent foreign experience Europe and Middle East. Box 31J403, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8.

LANDMAN—46, Twenty years experience with one major company in all phases of lease work in Mid-Continent, Rocky Mountain areas and Canada. Specialist in farm-out and drilling deals, good knowledge of gas transactions. Presently employed, prefer small company or independent. Box K-872, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - LANDMAN, B.S. Geol., M.B.A. Mgt., Now operating successfully on own, for valid reason desires position with company looking for proven oil finder and exploration administrator. Experienced U. S. and Canada in highly responsible company positions. Box K-853, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST - ENGINEER, 28, four years Rocky Mountain experience in exploration, development. Presently employed. Desires position with aggressive independent or consulting firm in Denver, Colorado. Box K-871, The Oil and Gas Journal, Tulsa, Oklahoma.

ANALYZER ENGINEER: ME, PE, age 31. 4 years experience in corrosion field, 2 years experience in applying plant stream analyzers and data handling equipment at a large refinery. Desire a technical/supervisory position in the advanced instrumentation field. Box K-873, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

CHEMICAL ENGINEER, 33, 8 years diversified experience process design, economic studies, project engineering, supervision, start-up, co-ordination entire projects refining and natural gas fields. Domestic or foreign considered. Box K-870, The Oil and Gas Journal, Tulsa, Oklahoma.

SCOUTING AND/OR LAND WORK—Young married man with B.B.A. from major college, experienced in scouting and land work on Texas Gulf Coast. Willing to relocate. Write 2806 Little John Dr. San Antonio 9, Texas or call TAylor 6-2427.

REAL ESTATE

TO BE SOLD SOON, privately or publicly, N½, Sec. 3, Twp. 19 N, R 1 W of I M, Payne Co., Okla. Part of estate of Eugene B. Hickman. On Highway 86, 8 mi. south of Perry, 13 west and 4 north of Stillwater. Lake Carl Blackwell borders at points on south. 90 acres cultivated. Conveniently located well has produced plenty of water for 50 years. Never drilled on for oil or gas. Old, producing wells within sight. Write Loren Moore, Executor, 811 S. Ash, Ottawa, Kansas.

PERSONALS

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management; Fernando Freyre, Legal; James R. Crow, Geological.

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FINANCIAL CONTACTS, Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817—51st St., Brooklyn, N. Y.

BUSINESS OPPORTUNITIES

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is interested in the acquisition of Independent Oil Companies or Private Production through purchase or merger. Give full details in first letter. Box K-838, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEASE AND DRILLING BLOCKS

WANTED—Oil & Gas Royalties for Investment. Commonwealth Trust Co. P. O. Box 350, Wilmington 99, Delaware.

FOR SALE—10,000 plus acres, 2 to 5 years oil leases in Breckinridge County, Kentucky. Will sell or deal for an over-ride. P. O. Box 187, Hardinsburg, Ky.

500 ACRE DRILLING BLOCK, Pawnee County, Oklahoma. Nearby production. Box K-858, The Oil and Gas Journal, Tulsa, Oklahoma.

SHALLOW KENTUCKY drilling deals, some in Green County. H. A. Miller, Glasgow, Kentucky.

CHEAP EAST TEXAS LEASES between deep strikes. Advancing, active drilling. References. E. M. Adams, Marshall, Texas.

FOR SALE: New 10 year term, 200 acre oil and gas lease, L. C. Estes Survey, Shelby County, Texas, hot play. $5.00 per acre. Write C. A. Parker, Box 507, Center, Texas.

ALASKA

Cook Inlet Basin, West Foreland Area: 20,000 acres. 1/8th override. $15.00 per lease acre.
Copper River Basin: 2,560 acres. 1/8th override. $1.00 per lease acre.
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PRODUCTION WANTED

WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

PRINCIPALS with unlimited funds seek any-sized oil-gas production. Give details; strict confidence. Box K-774, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL PRODUCTION WANTED—Fully or partially developed producing reserves. Integrated situations. Most any location if substantial size. Able responsible parties. Contact in confidence. Percy E. A. Converse, (broker) Pawnee Rock, Kansas.

LEGAL

SEALED BIDS will be received until 10:00 A.M., Mountain Standard Time, October 14, 1958, and opened at that time in the office of the Superintendent of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 162 tracts of Tribal land comprising 7,962.53 acres and 26,197.28 acres of individually owned trust or restricted Indian lands located in Roosevelt, Sheridan and Daniels Counties, Montana, for oil and gas mining purposes.

The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone, Poplar, PO 8-3411.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 149.69 acres of land in two parcels within the known geologic structure of Moffat Field, Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p. m., M.S.T., November 5, 1958, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. John L. Rankin, Manager.

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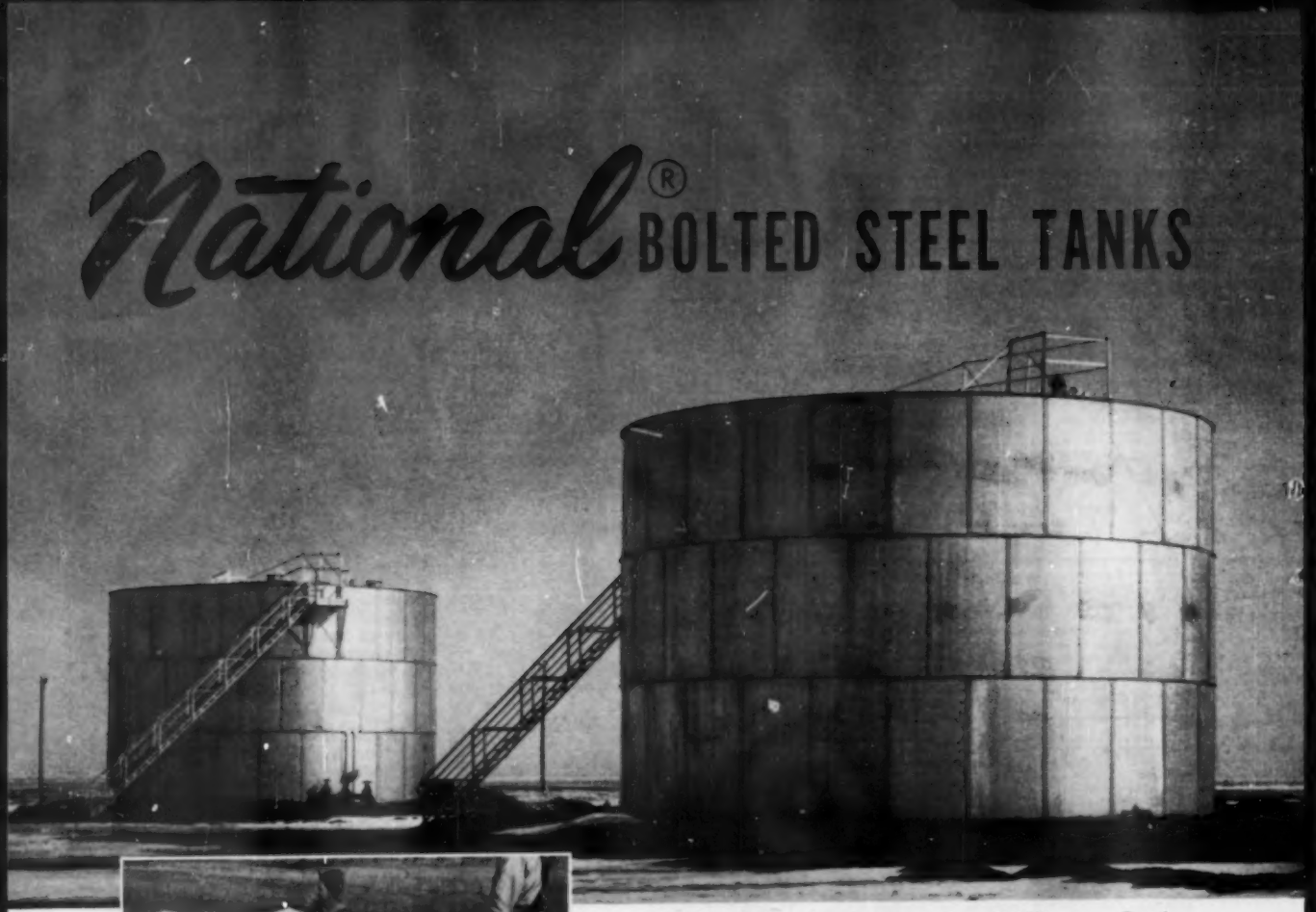

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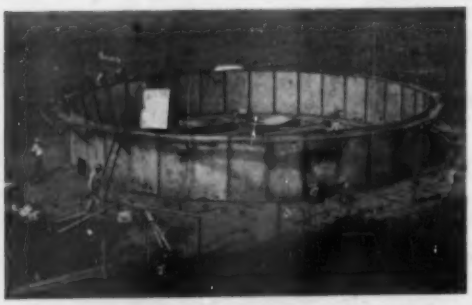

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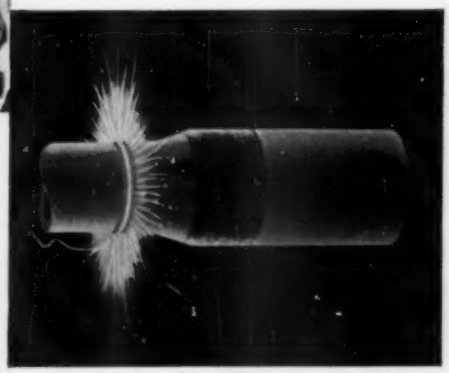

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